

Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

FEBRUARY 1957

One of Five Simmons-Boardman Railway Publications

formerly
RAILWAY
Mechanical and
Electrical Engineer

Roll Them
Out Like New

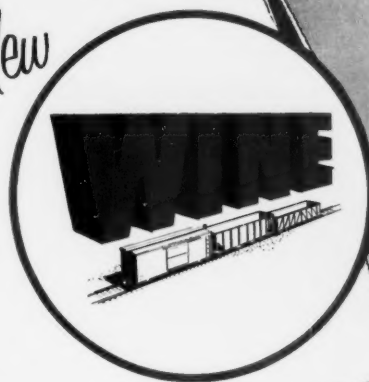
ACF Adapto

Filters Cleaned on
Production Line

CNR Auto
Transporter

PROVIDE A COMPLETE DEVICE FOR SECURING LADING BANDS...

New

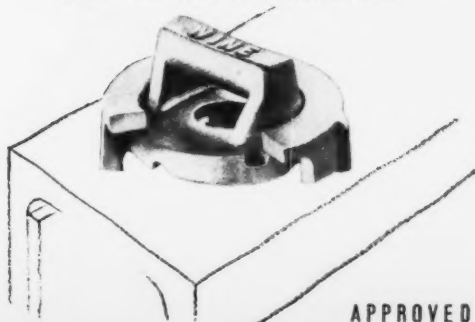


Universal LADING BAND ANCHOR

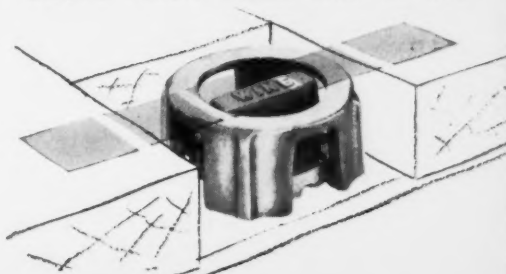
ROTATES 360 degrees

EASILY APPLIED
ON ALL FLAT CARS
AND GONDOLAS..

TOP COPING APPLICATION

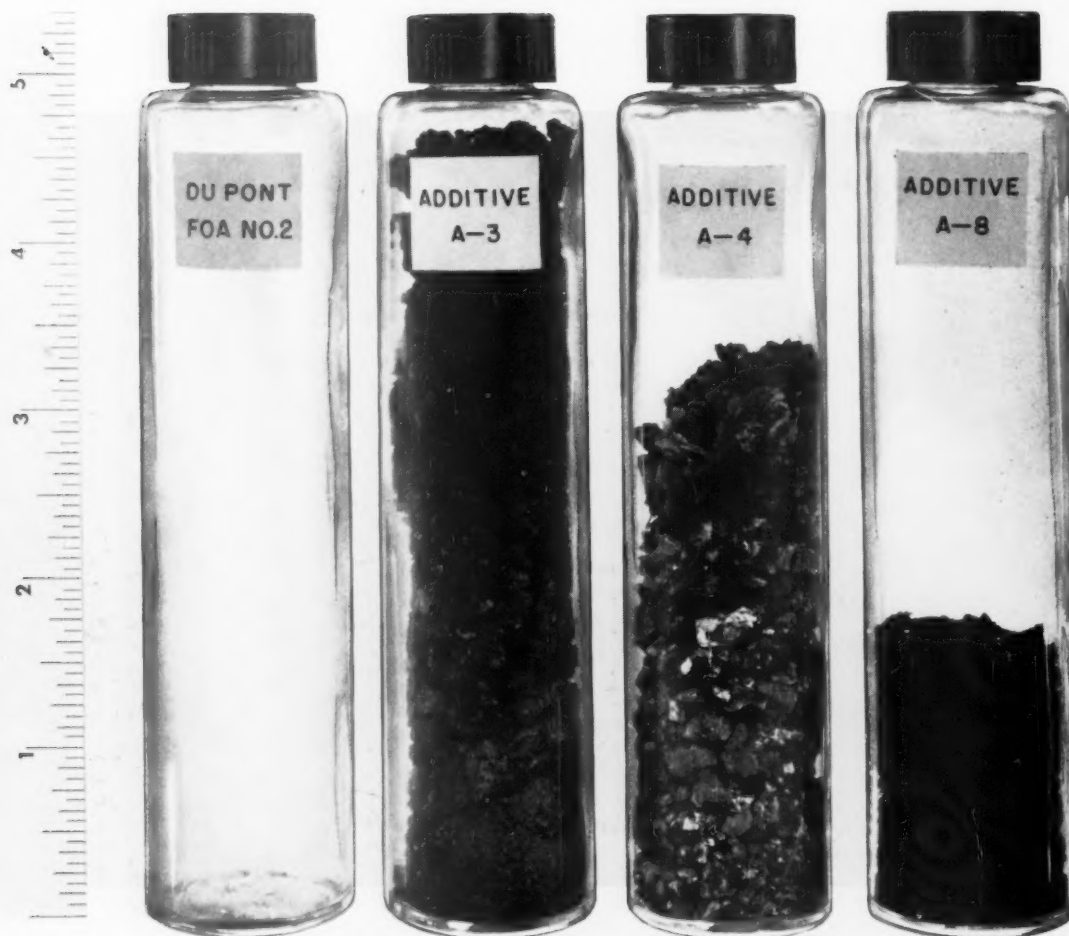


DROPS FLUSH WHEN NOT IN USE



APPROVED BY A. A. R. AS AN ALTERNATE STANDARD

THE WINE RAILWAY APPLIANCE CO., TOLEDO 9, OHIO



THESE BOTTLES CONTAIN the amount of ash left from burning four different diesel fuel additives—in cost-equivalent amounts that would be needed to treat 1,000 gallons.

Look...no ash left by diesel fuel additive!

Metallic additives in diesel fuel leave an ash residue after burning. Cumulatively, ash deposits are a potential sparking hazard.

This is because the metallic residues may bind together the carbonaceous particles formed in the exhaust ports and the exhaust barrel and reduce their glow temperature. Under heavy load, these particles are likely to be blown from the stack in an incandescent state. That's the hazard.

Ashless Du Pont additive

You can easily eliminate this cause of sparking by using an ashless additive. Being nonmetallic, Du Pont Fuel Oil

Additive No. 2 (FOA-2) leaves virtually no ash.

The bottle on the left contains the almost invisible amount of ash left after burning an amount of FOA-2 that would protect 1,000 gallons of fuel oil—at a concentration of 20 pounds per 1,000 barrels. The other bottles contain the ash left after cost-equivalent amounts of other additives were burned.

Prevents injector-sticking

Because it is an excellent stabilizer and

dispersant, Du Pont FOA-2 helps prevent injector-sticking and filter-plugging.

Ask your petroleum supplier about Du Pont FOA-2, or write us direct for more detailed information.



BETTER THINGS FOR BETTER LIVING
... through Chemistry

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why freight service today is the fastest in history...



ONE REASON IS TWO-WAY RADIO. Now the conductor in the caboose a mile behind is as close to the engineer as the phone at his fingertips. So are other trains, yardmasters, and the dispatcher 200 miles away. On some 13,000 locomotives and cabooses, instant "on the run" radio contact is saving countless hours each day.



Another 
contribution
to railroad
prosperity



ONE MORE BIG REASON IS HYATT HY-ROLL BEARINGS for non-stop freight. Hyatts banish hotboxes, one of the major causes of freight train delays. They eliminate time-wasting waits for inspection and lubrication, too, because they have a three-year grease supply sealed in. The new simplified design of HYATT Hy-Rolls makes them so economical to install and maintain that 38 progressive railroads have already adopted them. Roller bearings play a vital part in the multi-million-dollar rail modernization program to make America's freight service *better than ever before!* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

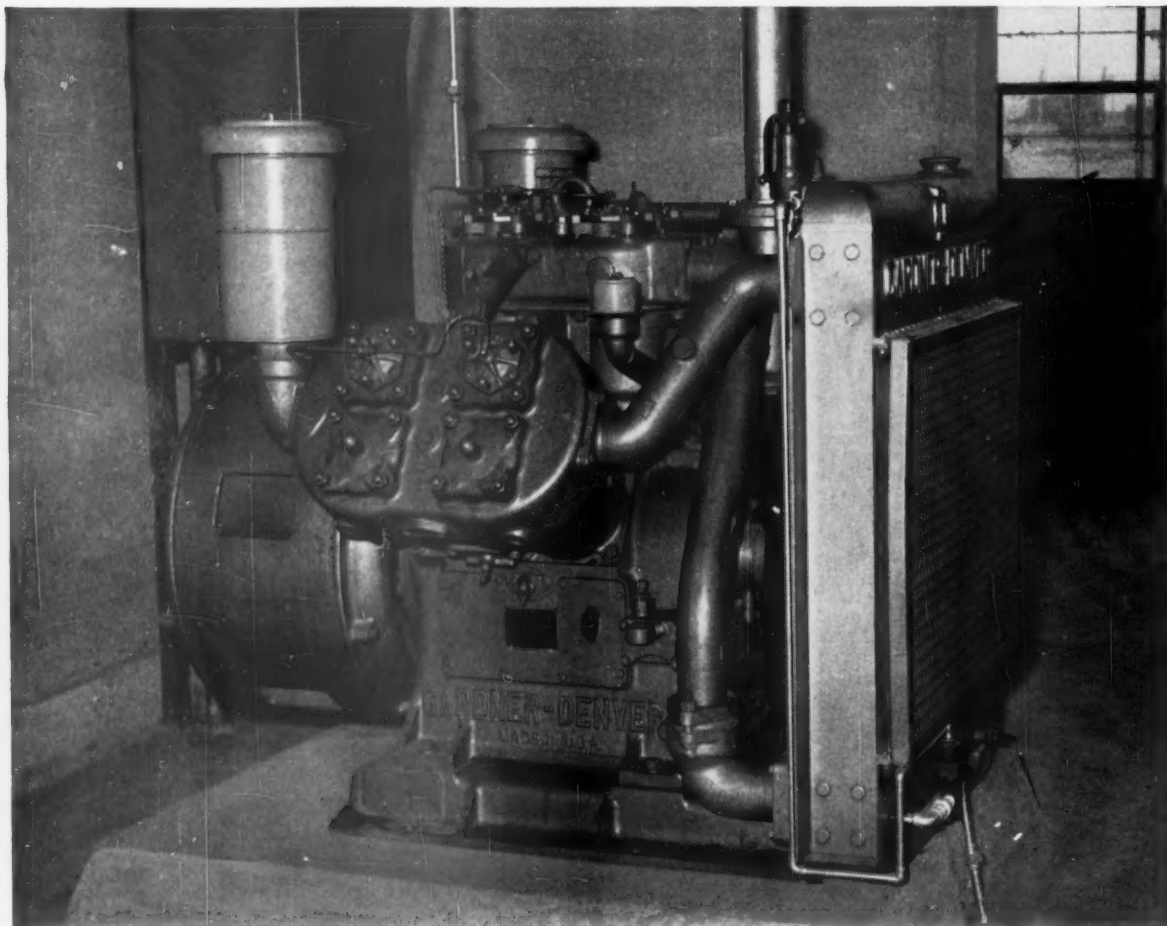
Watch "WIDE WIDE WORLD" Sundays on NBC-TV

HYATT

HY-ROLL BEARINGS

FOR NON-STOP FREIGHT

Gardner Denver . . . Serving the World's Basic Industries

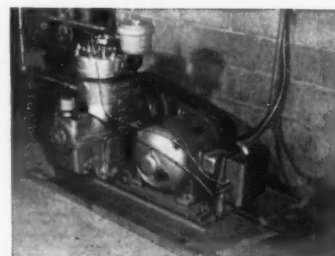


Moves in fast . . . starts right away . . .

Gardner-Denver WB Compressor

It's as easy as it looks in this picture to install a Gardner-Denver WB Compressor. Hook up the wiring . . . air line . . . controls—that's about all there is to it. Not much of a foundation is needed—because vibration has been designed out of the machine. The packaged unit has a built-in motor, and a self-contained radiator-intercooler that solves cooling-water problems.

Available in seven sizes from 142 to 686 cfm. Write for Bulletin WB-10, with full specifications.



Another popular Gardner-Denver compressor—noted for long, steady runs—the model AA. Bulletin AA6.

GARDNER - DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS
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Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



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Founded in 1832 as
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FEBRUARY, 1957

VOLUME 131, No. 2

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NEXT MONTH:

Interchange Rule
Changes
24RL Color Schematic



Freight Car Roller Bearing

A removable type freight car journal bearing, called the General Purpose Freight Car Bearing has been designed to reduced maintenance cost by permitting fast inspection and quick repairs without the need of expensive special equipment.

For inspection, the outer race assembly of the bearing is dismounted by hand while the inner race and enclosure collar, which are fitted to the axle, remain in place. The self-lubricating seal has several holes drilled between the lips of the seal. Besides providing an air vent, this design furnishes a means of disposing of excess lubricant, and uses this grease to lubricate the surface between the seal and the axle cap. A one-piece inner race carries the cylindrical rollers. With this one-piece inner race, only two bearing parts are pressed on the car axle—the inner race and the enclosure collar. The bearing itself consists of four parts, and only three touch the axle. The unit comes completely assembled, pre-greased for three-year service, boxed and mounted on pallets in car sets of eight bearings.

With this packaging, the bearing is mounted directly from the shipping box. After the bearing has been placed on the pilot shaft, the box is slipped off.

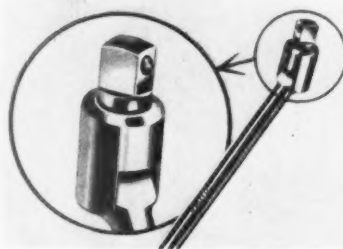
This roller bearing is adaptable to all car frame and freight car bearing standards set by the AAR. Now undergoing laboratory and field tests, the bearing is also available in a "free lateral" design. This design provides lateral freedom between the rollers and the outer race shoulder of the bearing. *SKF Industries, Inc., Dept. RLC, Philadelphia.*

Synthetic Paint Remover

The introduction of epon and epoxy based paints which provide tough, high quality finish, has resulted in complex paint removal problems. This remover was compounded to lift this type of paint.

Called LPO (lifts paint off), it is reported to blister the finish off in less

than five minutes, without damaging underlying wood or metal surfaces. The remover does not have to be heated to do its work. Two forms of the material are described: One, a standard heavy bodied form which is said to cling to a vertical surface and the other is an unthickened form recommended for tanks. It has no flash point. The manufacturer states that the surface from which paint has been removed by LPO need only be washed with water and dried before repainting. *RPO Chemical Corporation, Dept. RLC, 2727 East Nine Mile Road, Hazel Park, Michigan.*



Free-Wheeling Ratchet Wrench

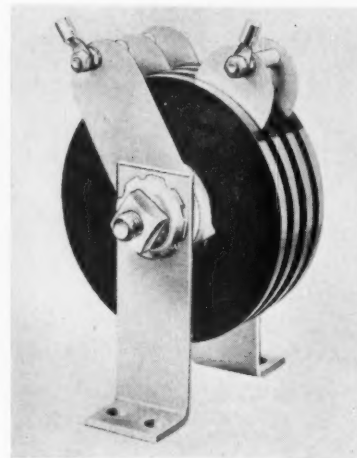
The No. 5457 Rotahead hinge handle tool has a self-contained mechanism that provides a free-wheeling action for socket wrenches. Pressing down on the head allows the handle to rotate in either direction. Release of pressure engages the drive plug for turning of the wrench.

With 30 teeth on the inner wheel, a new position can be secured every 12 deg. Made of alloy steel, it meets military specifications on torque load. Its compact head allows use of the tool in confined spaces on complicated equipment. Overall length is 16 in. *Plomb Tool Company, Dept. RLC, Los Angeles, Cal.*

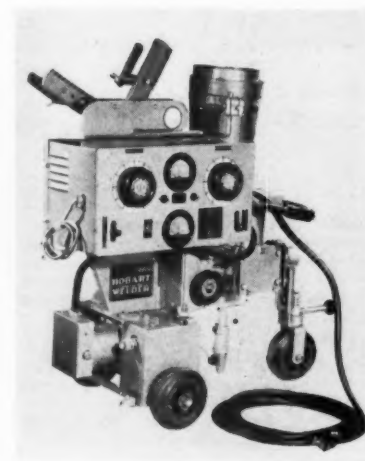
Discharge Resistor

This Thyrite discharge varistor assembly, type 9RV6A, is mounted for direct installation in electrical circuits and represents the first offering of voltage sensitive non-linear resistors of its type. It is designed to protect motors, generators, lifting magnets, magnetic chucks, solenoids, relays, coils, etc., against high inductive surges resulting from sudden interruption of inductive currents.

The resistors are made in ready-mounted groups of 1 to 4 varistors. Each



disk is 6 in. in diameter and $\frac{3}{8}$ in. thick, with a 1 in. central mounting hole. The disks are bracket mounted on a horizontal insulated bolt with a spring lock washer to provide contact pressure. Spacers permit air circulation. Continuous watts loss is only about 2 per cent of an equivalent fixed resistor required to provide the same protection. *General Electric Company, Dept. RLC, Detroit 32.*



Tractor Type Submerged-Arc Welder

A tractor type automatic submerged arc welding unit for welding operations involving long seams, straight or curved, such as are involved in the welding of tanks is being announced.

It will weld backward or forward,

(Continued on page 8)

for a sharper point...

Fairbanks-Morse

Unit Exchange



F-M Unit Exchange provides a way to meet increased tonnage demands on your motive power fleet—yet reduces your need for repair shop facilities . . . large parts inventory.

In minimum time you can upgrade your F-M power . . . exchange complete engines, blowers, pumps, F-M generators and traction motors. Your exchange equipment meets brand-new specifications and performance. And it carries the same warranty as new equipment.

Unit Exchange offers you the quickest way to return a locomotive to more profitable service at reduced maintenance. Fairbanks, Morse & Co., Dept. RLC-2, Chicago 5, Illinois.



FAIRBANKS-MORSE

a name worth remembering when you want the BEST

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**THE JBS ACME JOURNAL LUBRICATOR
—THE LOWER COST LUBRICATOR
THAT FULFILLS ALL REQUIREMENTS:**



**AAR APPROVED FOR 10,000 CARS
IN GENERAL INTERCHANGE SERVICE**

Heavy loop pile surfaces designed for easy application and removal, special unsized duck casing. REINFORCED SIDING TO STAND EXTRAORDINARY WEAR AND TEAR.

100% wool-batt core quilted construction to assure stability available in two sizes: 9-10 for 9" and 10" AAR standard journal boxes and 11-12 for 11" and 12" standard boxes.

A POSITIVE ADVANCE IN JOURNAL LUBRICATION

- CANNOT POSSIBLY GLAZE!
- IS UNAFFECTED BY TEMPERATURE CHANGES.
- HAS EXCEPTIONAL WICKING and FILTERING qualities.
- Contains an UNUSUALLY LARGE OIL RESERVOIR.
- IS RECLAIMABLE!

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"40 Years in Car Lubrication"
Sales Office: 332 S. Michigan Ave., Chicago 4, Ill.
General Office: 3113 S. Western Blvd., Indianapolis 16, Ind.

EQUIPMENT

(Continued from page 6)

either when locked into position for a straight line seam, or when maneuvered by the operator on a curved or irregular seam. An adjustable nozzle permits welding either on a flat butt joint or on a fillet joint.

The basic unit is a fully automatic submerged arc welding unit, with free-wheeling tractor features built-in to insure positive control, maneuverability, and high efficiency. It is made with and without remote control of welding voltage. Hobart Brothers Co., Troy, Ohio.



Multiple Outlet Box

A heavy duty multiple outlet box, designed to meet the needs of testing and repair shops, is now being marketed. The unit, Model MO, contains six long life replaceable sockets, a neon indicator light, and an ON-OFF switch that controls the entire unit. These are mounted in a rugged, drawn metal case.

The heavy rubber-jacketed supply cord measures 10 ft. The a-c plug contains two fuses thereby protecting equipment. The unit can be mounted as a permanent arrangement, or it can be portable for use where needed. It is finished in brown hammertone with dark brown component parts. It is rated at 15 amp, 110 volts. CBC Electronics Company, Inc., Dept. RLC, Philadelphia 33.

Protective Metal Coating

New iron and steel as well as rusted metal may be protected with "Zinktron", zinc-based primer. The coating offers chemical and mechanical protection at the same time by using a super-fine binding material which allows the majority of zinc particles to come in contact with the metal surface being coated. The liquid may be applied with brush or spray and dries tack-free in 40 min. The primer prevents rust-creep and is nonblistering. Any oil based paint may be used over it.

Laboratory results are available for salt spray, adhesion, bending and the Preece test. *Constad Laboratories, 85-02 162nd st., Jamaica, N. Y.*

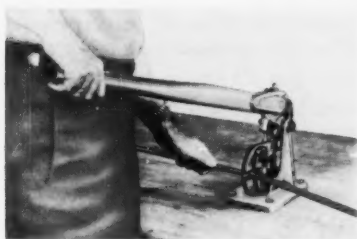


Electric-Drive Gas Truck

Electric-drive complete with dynamic braking has been applied to a four-wheel industrial truck called the Model GLT Dynamotive. The power plant consists of a Continental gasoline engine, directly coupled to an electric generator. The generator powers a high-torque electric motor which, in turn drives the wheels through a differential. The manufacturer states that the drive has a high efficiency resulting in a fuel saving of over 25 per cent. Maintenance costs are said to be reduced by the elimination of clutches, torque converters and mechanical or fluid transmission.

Engine life is prolonged by the elimination of road shock through the transmission. Power is smoothly applied by increasing engine speed with the foot accelerator. Dynamic braking provides longer brake life and surer control on grades.

The tractor has a drawbar pull of 600 lb normal and 2,000 lb ultimate. Its overall length is 79½ in. *Automatic Transportation Co., Dept. RLC, Chicago 20.*

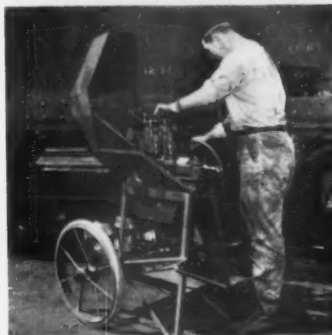


Heavy-Duty Cutter

The Heavy-Duty Work-Station Cutter is said to reduce labor in cutting bolts, rods, chain, bars, cable, rods, etc., especially at work stations where operations are repetitive. Two sizes—No. 1 and 3—are offered with a variety of jaws for cutting specific materials. The cutter can be attached wherever a job is to be done. Soft or medium hard metals up to ½

RENT or BUY . . .

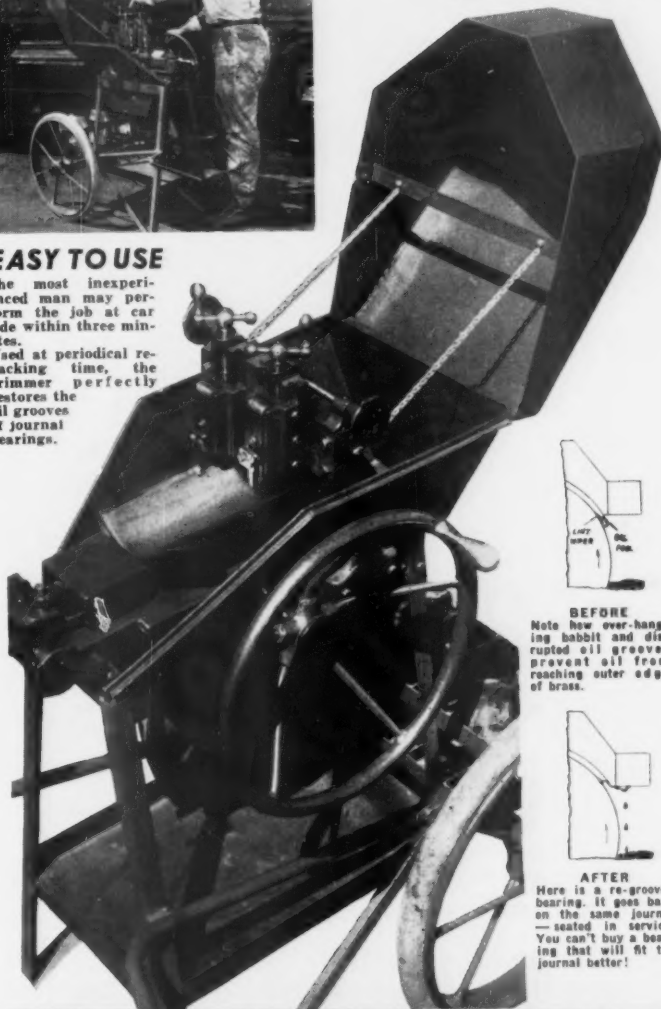
THE FAMOUS JBS BRASS TRIMMER
SAVES \$5.00 ANNUALLY PER CAR!



*Many years of service records verify even greater savings!

EASY TO USE

The most inexperienced man may perform the job at car side within three minutes. Used at periodical repacking time, the trimmer perfectly restores the oil grooves of journal bearings.



BEFORE
Note how over-hanging habit and disrupted oil grooves prevent oil from reaching outer edge of brass.



AFTER
Here is a re-grooved bearing. It goes back on the same journal—seated in service. You can't buy a bearing that will fit the journal better!

BEARINGS BETTER THAN NEW!
ELIMINATES CRUCIAL BREAK-IN PERIOD

Trimming and reapplication to the journal from which removed results in the perfectly FITTED BEARING and eliminates the hazard of failure during the otherwise crucial break-in period of a new bearing.

AAR APPROVED

The trimming of bearings has been approved as a CHARGEABLE ITEM on cars in interchange.

JOURNAL BOX

SERVICING CORPORATION

50 Years in the Industry
Sales Office: 332 S. Michigan Ave., Chicago 4, Ill.
112 E. Wacker Drive, Chicago 4, Ill.



How Oakite Steam Gun Cleaning delivers low-cost end results

Better *results* almost always mean bigger *savings* in cleaning. So use the best in methods as well as materials—it's least expensive in the end.

Cleaning with this Oakite Steam-Detergent Gun, for example, amplifies the penetrating, soil-loosening action of cleaning compound by means of steam heat and jet force.

It blasts out even heaviest, most stubborn soils from hard-to-reach places. It cuts clean-up and rinsing time as much as half. That's a *big* contribution to real economy.

This money-saving equipment has no end of uses. Connected to your steam supply, the gun can clean traction motors, truck, locomotive frames—even strip paint. Want it demonstrated in your shop to your men? Just write OAKITE PRODUCTS, INC., 46 Rector Street, New York 6, N. Y.



... gives you the important advantage
LOW-COST END RESULTS

Export Division Cable Address: Oakite

RAILROAD DIVISION

in. in diameter can be cut by hand power alone. The handle pulls toward the operator, providing a natural action which increases power. The other hand is free to feed the stock. *H. K. Porter, Inc., Dept. RLC, Somerville, Mass.*



Air-Motor Jacks

Two jacks, 20- and 35-ton models, have been added to this company's line of air motor equipment.

These jacks are said to be lightweight, easily portable on semi-pneumatic tires, and capable of lifting gondolas or empty freight cars with ease. A "Toe Lift" increases efficiency when lifting loads too low for the cap on the top of the piston.

The units have spur gearing. Bearings are high-tin bronze or precision type, anti-friction. The models described have pressure lube fittings at the required points. *Joyce-Cridland Co., Dept. RLC, Dayton, Ohio.*

Soldering Iron Tips

These Hexclad soldering tips, coated with a durable layer of iron alloy, are said to outlast plain copper tips more than 10 to 1. Costly maintenance is eliminated because they require no filing or dressing due to pitting or erosion. The tips are available in 40 stock sizes and shapes to fit most makes of soldering irons. *Hexacon Electric Company, Dept. RLC, 547 West Clay avenue, Roselle Park, N. J.*



Portable Sander

This No. 16 SpeedSander was designed to combine high volume production with
(Continued on page 84)

INSIDE STORY ON BETTER SHUNT CONSTRUCTION

Thermoplastic cap protects amalgam from oxidation, prevents shunt fray-offs and pull-outs. ★

Power loss reduced to a minimum by more intimate contact between brush and connection. →



Minimum power loss with maximum brush life... less down time for maintenance... top performance under widely varying road conditions. You can count on all these advantages with "National" brushes because their tamped, plastic-protected shunt connection offers the lowest possible resistance to current flow.

All grades and construction features of "National" brushes are proved in road operation before being offered for regular service. You can always depend on them for superior commutation ability, excellent commutator condition *with* long life.

NATIONAL BRUSHES Best for all types of equipment... preferred for all types of service. Order through your equipment manufacturer.

More positive
shunt connection of

NATIONAL
TRADE MARK
BRUSHES

gives greater
operating economy

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Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. In Canada: Union Carbide Canada Limited, Toronto

**Budd Lightweight Cars
For Commuter Service**

The 132-passenger multiple-unit commuter coaches for the Pennsylvania, the order for which is reported in this issue, are based on the Budd "Pioneer III" design unveiled last summer, the first of which has since been in test service on the Pennsylvania between New York and Washington. The order was accompanied by an option on 44 duplicate units, further improvements in which will be made after the six have been tested in service and customer reaction and operating results studied. The 50 cars are expected to cost \$9,000,000.

"We hope eventually to replace most of the older cars [471 electric motor cars and 45 trailers] in our suburban service and to operate our commuter service with maximum efficiency," W. W. Patchell, PRR vice-president—research and development, said in announcing the order. "In this way we hope not only to increase commuter patronage, but also to reduce railroad operating costs and cut our losses in this service."

Each of the new stainless-steel cars will be equipped with outboard disc brakes and powered with four newly designed electric traction motors. These motors will accelerate the car, which Budd estimated earlier would weigh 83,000 lb. from a standing start to 30 mph in 25 sec.

The 132 passengers will be seated in reversible seats arranged to accommodate three on one side of the aisle and two on the other. The cars will have pastel-colored, plastic-faced interiors and fluorescent lighting. They will be completely air-conditioned and will have thermostatically controlled electric heating.

**Machine Design
Award Program**

The \$25,000 Machine Design Award Program, sponsored by the James F. Lincoln Arc Welding Foundation, closes July 15, 1957. The program offers 26 awards, ranging up to \$4,000, for papers giving the best descriptions of the design and fabrication of machines or machine components which are designed for arc welded steel fabrication. Details concerning the program can be had by writing the Secretary, The James F. Lincoln Arc Welding Foundation, Box 3035, Cleveland 17.

Revised Tank Car Specifications

The AAR is concerned over the response so far, to the complete revised 1956 edition of specifications for tank cars. This edition supersedes the previous edition of August 1, 1941, and gives complete coverage of new requirements, particularly those pertaining to all-welded tank cars.

At a recent meeting of the Tank Car Committee, it was the opinion of the

**ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING
OF THE JANUARY ISSUE**

DIESEL-ELECTRIC LOCOMOTIVE ORDERS				
Road and Builder	No. of units	Horse-power	Service	Other detail
CANADIAN NATIONAL:				
General Motors Diesel, Ltd.	20	—	Passenger	Deliveries of 222 units, expected early this year, will start plan of completely dieselizing territories, starting from Road switch, east and west coasts.
	84	1,750	Road switch	
	18	1,200	Road switch	
	10	900	Yard switch	
Montreal Locomotive Works				
	56	1,800	Road switch	
	5	1,000	Road switch	
	29	1,000	Yard switch	
ILLINOIS CENTRAL:				
Builder unnamed	4	—	Passenger	Cost, \$920,000. Delivery expected during first quarter this year.
NORTHERN PACIFIC:				
Electro-Motive	20	1,750	Road switch	Replaces previous order for five 4-unit freight locomotives reported in June 1956 issue.
VIRGINIAN:				
Fairbanks, Morse	6	2,400	Road switch	These in addition to a previous order for "Train Masters." Delivery scheduled for second quarter of this year.
FREIGHT-CAR ORDERS				
Road and Builder	No. of cars	Type	Cap., tons	
CONEMAUGH & BLACK LICK:				
Bethlehem Steel	25	Gondola	25	Approx. cost, \$250,000. Delivery scheduled for second quarter this year.
NORTHERN PACIFIC:				
ACF Industries	50	Tank	—	19,000-gal. Delivery expected in June
TENNESSEE CENTRAL:				
Greenville Street Car	10	Covered hopper	70	Delivery expected in May.
TORONTO, HAMILTON & BUFFALO:				
National Steel Car	50	Gondola	70	Deliveries of both lots expected in October.
	10	Covered hopper	70	
PASSENGER-CAR ORDERS				
Road and Builder:	No. of cars	Type		Other detail
HUDSON & MANHATTAN-PENNSYLVANIA:				
St. Louis Car	50	—	—	To be air conditioned. Each car to be 51 ft long, 3 ft longer than cars now in service. 30 to be paid for by PRR—\$2,563,788; 20 to be paid for by H&M—\$1,675,272.
PENNSYLVANIA:				
Budd	6	Commuter coaches	—	Cost, \$1,500,000. See news item first column this page.

FREIGHT CARS:

Delaware, Lackawanna & Western.—Will convert, in company shops, 50 cars for use in piggy back service.

Illinois Central.—Plans to construct 2,000 box cars in company shops; cost, \$13 million. In addition, will finish 1956 backlog of 500 box cars delayed because of steel strike. Also budgeted—110 flat cars, 50 steel caboose cars, and conversion of 150 freight cars for specialty loading.

Northern Pacific.—Has scheduled 1957 purchase of 150 cars for hauling logs. Plans to rebuild 200 box cars into double-deck stock cars in company shops. Estimated cost, \$720,000. Delivery about third quarter of year.

Vireinian.—Ordered materials for construction, in company shops, of 500 70-ton hopper cars during last half of 1957.

INQUIRIES AND NOTES

committee that it would be to the best interests of the railroads, and the shippers and receivers of all commodities hauled in tank car equipment, if all roads would recognize the necessity for distribution of this publication to all supervisory forces and to each car foreman in limited amounts, depending on the number of yards under his jurisdiction.

**L&N Sponsors New
Educational Program**

The Louisville & Nashville has established the following educational program for the purpose of encouraging and assisting supervisory personnel to begin a systematic study of his chosen field.

1. Eligibility—Any supervisory employee* under 40 years of age, in good

health, with not less than a high school education, and with three years' employment in the L&N service may apply for enrollment provided he passes the required examination given new applicants for employment, and he has the recommendation of the supervisory officer in the department where he works.

2. L&N will pay tuition in an accredited school or college, or an acceptable extension course of study by mail—

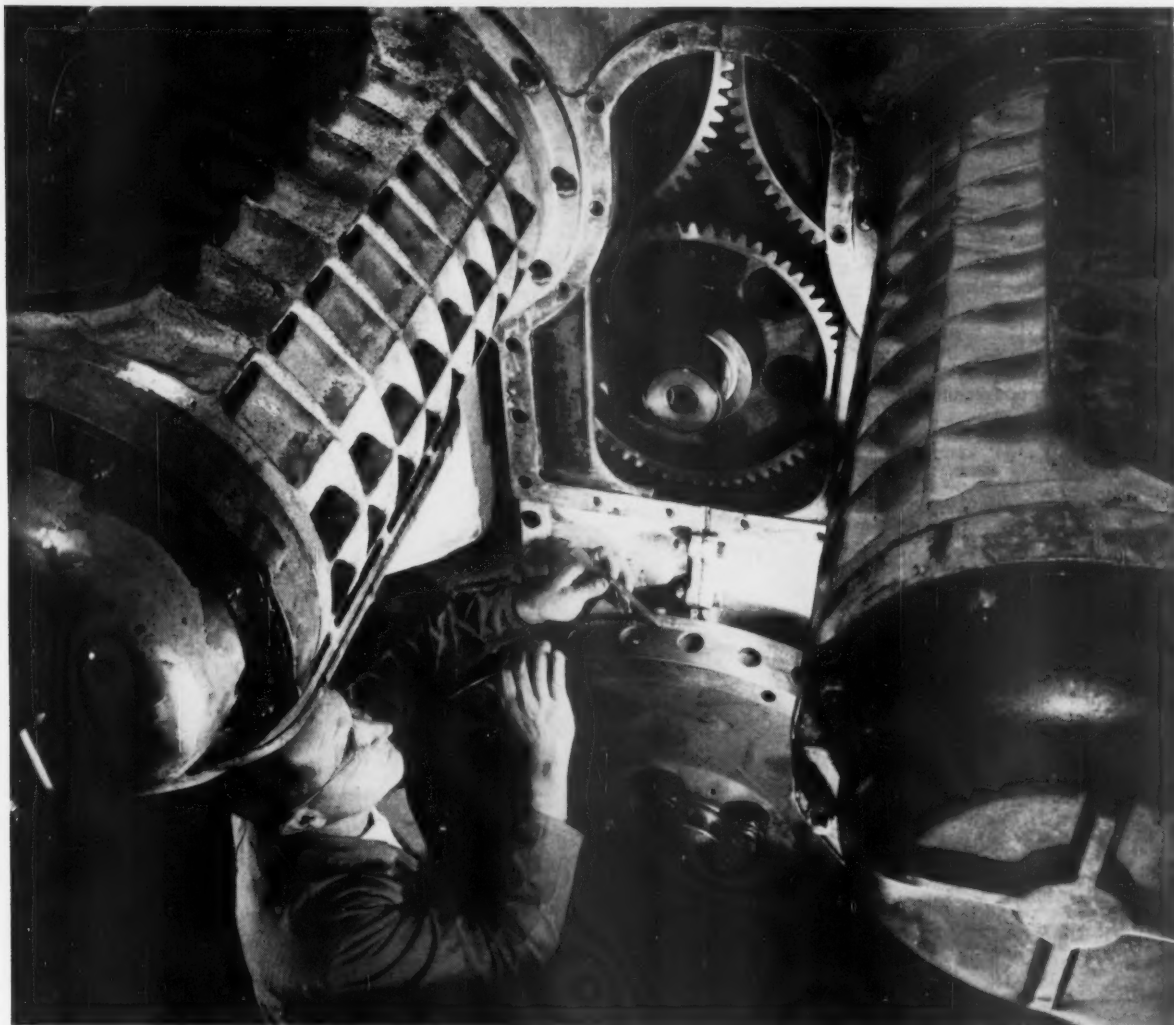
(a) While employee is working if study classes do not conflict with working hours.

(b) While employee is working part

Note—*A supervisory employee is one of rank of foreman, assistant foreman, chief clerk, assistant chief clerk or higher.

ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL RR
FIRM NORTHERN PACIFIC RAILWAY
South Tacoma, Wash.



RR diesel gears show only $\frac{1}{2}^\circ$ wear in $2\frac{1}{2}$ million miles

Timing gears on this Northern Pacific GMC-diesel locomotive engine, lubricated with RPM DELO Oil RR, recently completed $2\frac{1}{2}$ million miles of severe freight service without repairs or adjustment. NP's South Tacoma Shop Foreman, A. R. Genin (above), indicates degree marks on engine flywheel, used to gauge gear wear. Tolerance between gear teeth shows variance of just $\frac{1}{2}^\circ$ from original setting. Mr. Genin says, "We consider this low rate of wear remarkable for heavy-duty freight operation. It is typical of our experience during the 12 years we have used RPM DELO Oil in all our locomotive diesels." Engines are 1350 h.p. 16-567 series.



TRADEMARK "RPM DELO" AND
DESIGN REG. U. S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey

Why RPM DELO Oil RR reduces wear, corrosion



• Oil stays on engine parts—hot or cold, running or idle • Anti-oxidant resists lacquer formation • Detergent keeps parts clean • Special compounds prevent corrosion of bearing metals • Inhibitor resists foaming.

STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA COMPANY, Denver 1, Colorado

time, provided that working period or time available for work aggregates not less than six months per year. An employee desiring such arrangement must have the detailed plan approved by the supervisory officer in the department where the employee works.

- (c) While employee is on leave of absence with the intention of returning to L&N service within one year.

3. Employee may select courses to be studied, but upon his request the personnel officer will advise courses that may be helpful in the improvement of the education of the employee in his chosen field.

4. Employee enrolling for a study course must make satisfactory progress. The L&N reserves the right to withdraw its support upon the recommendation of the superior officer in the department where the employee works.

This new program is the latest phase of a personnel development plan which has been going on for some years, and was placed on a systematic basis some 10 years ago.

Box Cars With Plug and Sliding Doors on One Side

The growing demand for box cars equipped with wide door openings to provide for mechanized loading and unloading of packaged lumber, steel, etc., together with the use of the car at any time for grain or other bulk loading, has been recognized by the AAR's Car Construction Committee.

The committee feels that the interest of the railroads would be well served if each road contemplating new box car construction of this type, would investigate the design of car with the 16-ft. clear opening as being the "most acceptable car" for mechanized loading and unloading.

By concentrating on construction of door arrangement of this size, cars of this type can be built at less cost, the committee said. This would provide equipment necessary for a variety of shippers' needs and would be in line with suggestions and requirements of a large segment of shippers using rail transportation.

The committee has also found it "desirable" to maintain the principle of one plug type and one sliding type door on each side.

BOOKS

HEATING VENTILATING AIR CONDITIONING GUIDE 1956. The technical data section of this 34th edition contains 1,176 pages. The Catalog Data Section presents material concerning the products of 335 manufacturers. Some chapters are new and others have been almost completely rewritten. Particular attention has been given to the presentation of heat transmission coefficients of building materials. More tables make it easier to compute the effect of adding air spaces or insulations to walls, ceilings

or floors. Other material which has been rewritten is that concerned with automatic control and a description of current control equipment using the latest nomenclature. The technical data continues to be presented in 53 chapters grouped under seven sections.

American Society of Heating and Air-Conditioning Engineers, 62 Worth street, New York 13. Price, \$12.

SIGNIFICANCE OF ASTM TESTS FOR PETROLEUM PRODUCTS. This third edition concisely outlines the significance of the various ASTM methods of test related to petroleum products and calls attention to their limitations. It has been prepared for petroleum executives, engineers, laboratory technicians, etc., and those concerned with the properties

of petroleum products and the tests thereof to help them acquire a general idea of the various methods of test and to understand performance characteristics of specific products and the significance of the properties of petroleum products in relation to one another. Few technical terms are used. Each chapter discusses a particular property or characteristic, covering the importance of sampling, selection of test apparatus, methods of test which apply and their significance. For full details of the individual test, reference must be made to the 1956 edition of "ASTM Standards on Petroleum Products and Lubricants" (price, \$6.75). The eleven chapters, determined by general properties, are Sampling Petroleum Products, Measurement and Calculation of Volume, Volatility, Combustion, Oxidation Characteristics, Flow Characteristics and So-

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.	Month of October		10 months ended with October	
	1956	1955	1956	1955
3 Road locomotive miles (000) (M-211):				
3-05 Total, steam	4,144	6,261	39,479	54,816
3-06 Total, Diesel-electric	38,910	37,815	372,279	353,681
3-07 Total, electric	752	813	7,300	7,515
3-04 Total, locomotive-miles	44,097	45,119	421,569	418,212
4 Car-miles (000,000) (M-211):				
4-03 Loaded, total	1,817	1,868	16,940	16,739
4-06 Empty, total	979	933	9,384	9,119
6 Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01 Total in coal-burning steam locomotive trains	10,495	14,420	98,066	126,769
6-02 Total in oil-burning steam locomotive trains	1,745	3,066	12,814	21,936
6-03 Total in Diesel-electric locomotive trains	114,737	109,740	1,075,090	1,003,853
6-04 Total in electric locomotive trains	2,417	2,456	22,734	22,865
6-06 Total in all trains	130,378	130,412	1,217,584	1,182,662
10 Averages per train-mile (excluding light trains) (M-211):				
10-01 Locomotive-miles (principal and helper)	1.03	1.03	1.03	1.02
10-02 Loaded freight car-miles	44.2	44.5	43.1	43.0
10-03 Empty freight car-miles	23.8	22.2	23.9	23.4
10-04 Total freight car-miles (excluding cabooses)	68.0	66.7	67.0	66.4
10-05 Gross ton-miles (excluding locomotive and tender)	3,171	3,106	3,100	3,037
10-06 Net ton-miles	1,477	1,444	1,422	1,390
12 Net ton-miles per load car-mile (M-211)	33.4	32.5	33.0	32.1
13 Car-mile ratios (M-211):				
13-03 Per cent loaded of total freight car-miles	65.0	66.7	64.4	64.7
14 Averages per train hour (M-211):				
14-01 Train miles	18.2	18.4	18.5	18.6
14-02 Gross ton-miles (excluding locomotive and tender)	57,153	56,440	56,848	56,001
14 Car-miles per freight car day (M-240):				
14-01 Serviceable	48.8	49.3	46.8	46.8
14-02 All	47.0	47.2	45.0	44.3
15 Average net ton-miles per freight car-day (M-240)	1,020	1,022	956	921
17 Per cent of home cars of total freight cars on the line (M-240)	39.6	39.3	41.7	45.7

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

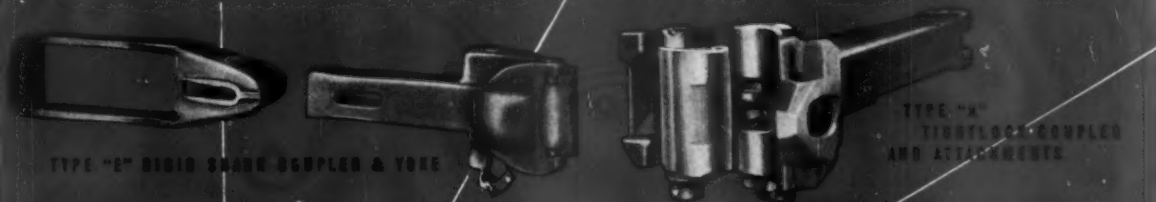
3 Road motive-power miles (000):				
3-05 Steam	584	1,244	7,409	13,993
3-06 Diesel-electric	20,068	20,082	202,834	202,407
3-07 Electric	1,212	1,229	12,458	13,019
3-04 Total	21,829	22,556	222,702	229,425
4 Passenger-train car-miles (000):				
4-08 Total in all locomotive-propelled trains	224,405	230,760	2,305,585	2,347,084
4-09 Total in coal-burning steam locomotive trains	3,736	7,396	45,943	79,843
4-10 Total in oil-burning steam locomotive trains	586	3,423	14,352	41,821
4-11 Total in Diesel-electric locomotive trains	205,462	205,587	2,096,407	2,076,101
12 Total car-miles per train-mile	9.79	9.78	9.81	9.82

YARD SERVICE (DATA FROM I.C.C. M-215)

1 Freight yard switching locomotive-hours:				
1-01 Steam, coal-burning	239,042	331,260	2,327,287	2,863,484
1-02 Steam, oil-burning	31,508	54,373	310,010	488,749
1-03 Diesel-electric	4,032,731	3,894,482	38,080,427	36,457,886
1-06 Total	4,307,686	4,285,141	40,753,948	39,874,179
2 Passenger yard switching hours:				
2-01 Steam, coal-burning	5,471	7,571	57,236	83,909
2-02 Steam, oil-burning	3,178	6,067	32,818	52,781
2-03 Diesel-electric	249,896	245,836	2,473,188	2,436,987
2-06 Total	282,662	285,715	2,810,200	2,831,763
3 Hours per yard locomotive-day:				
3-01 Steam	7.4	7.1	6.3	5.8
3-02 Diesel-electric	16.2	16.2	15.7	15.6
3-05 Serviceable	16.2	15.9	15.7	15.3
3-06 All locomotives (serviceable, unserviceable and stored)	15.1	14.5	14.3	13.7
4 Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.65	1.60	1.67	1.65
5 Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.78	.76	.75	.75

1 Excludes B and trailing A units

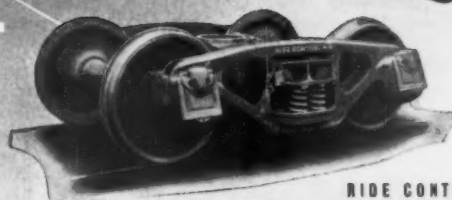
Since 1902..
'DEPENDABILITY IN SERVICE'



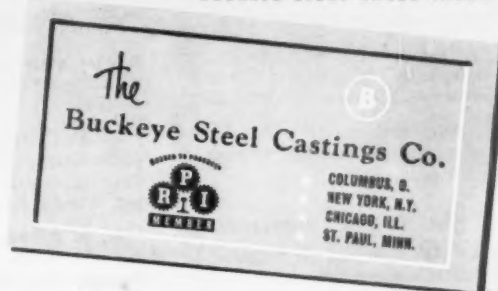
.. a time-proven feature of all



**STEEL CASTINGS for
RAILWAY EQUIPMENT**



FOR COMPLETE INFORMATION . . . CALL or WRITE
 Refer Adv. No. 11876



lidification, Corrosion, Other Physical Characteristics and Tests, Chemical Analyses and Tests, Analysis for Hydrocarbon Types, and Butadiene Analysis.

American Society for Testing Materials, 1916 Race street, Philadelphia 3. Price, \$2.50.

"TENTATIVE REFERENCE PHOTOGRAPHS FOR MAGNETIC PARTICLE INDICATIONS ON FERROUS CASTINGS" (E 125-56T). Discontinuities in iron and steel castings detectable by the dry powder magnetic particle method may now be classified by comparison with these reference photographs published by the ASTM. The photographs, showing indications observed on actual castings, have been reproduced through the courtesy of the Steel Founders' Society of America from photographs obtained from its member companies. They cover linear discontinuities (hot tears and cracks), shrinkage, inclusions, internal chills and unfused chaplets, porosity, weld discontinuities, false indications, and magnetic anomalies.

American Society for Testing Materials, 1916 Race street, Philadelphia 3. Price, \$2.50.

AXLE RESEARCH. MECHANICAL RESEARCH REPORT MR-242, "Fatigue Tests of Freight Car Axles"—Second Progress Report, dated June 1955—concludes the fatigue tests of the raised wheel seat, un-machined body freight-car axle which is now an alternate standard for freight cars. *Price: To members, \$1.75; to others, \$3.50.*

MECHANICAL RESEARCH REPORT MR-243, "Effect of Overheating on the Fatigue Resistance of Plain Bearing Axle Journals"—Second Progress Report, dated July 1956—contains additional data accumulated in the investigation of overheated journals, supplementing MR-212, First Progress Report. The investigation

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
October, 1952	3,093,990	4,058	8,053	12,111	255,469
October, 1953	3,042,559	3,863	6,493	10,356	293,796
October, 1954	2,852,826	5,182	6,985	12,167	234,472
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444
1956					
January	2,925,109	2,029	4,302	6,331	462,029
February	2,794,161	2,570	5,611	8,181	341,542
March	3,027,684	2,517	6,212	8,729	346,853
April	2,930,389	3,202	6,881	10,083	290,626
May	3,063,427	4,672	10,903	15,575	196,688
June	2,973,732	6,777	15,125	21,902	135,774
July	2,788,347	8,484	16,067	24,551	113,573
August	3,039,173	9,891	16,892	26,783	113,474
September	2,918,875	6,834	12,629	19,463	149,970
October	3,113,460	4,357	8,429	12,786	243,505

to date has included fatigue testing of axles overheated under controlled laboratory procedures and axles removed from railroad service because of overheating. *Price: To members, \$2.25; to others, \$4.50.*

Fred Peronto, secretary, Mechanical Division, Association of American Railroads, 59 East Van Buren st., Chicago 5.

ASTM MANUAL FOR RATING MOTOR FUELS BY MOTOR AND RESEARCH METHODS. This manual was prepared by ASTM Committee on Petroleum Products and Lubricants to revise and bring up to date the ASTM methods for determining the knock characteristics of motor fuels by the Research and Motor Methods and better to serve users of ASTM knock test engines by providing six appendices, presenting by

word and picture, factual information and data on the operation and maintenance of the knock-testing equipment. Methods are: Standard Method of Test for Knock Characteristics of Motor Fuels, by the Motor Method (D 357), and Standard Method of Test for Knock Characteristics of Motor Fuels by the Research Method (D 908), commonly referred to as the Motor and Research methods. Also included are six appendices on apparatus, reference materials and blending accessories, operation, maintenance, installation and assembly, building and utility requirements, which contain valuable and necessary information for conducting standardized octane ratings on motor fuels.

American Society for Testing Materials, 1916 Race street, Philadelphia 3. Price, \$6.75.

Personal Mention

Canadian Pacific

ROY W. WILSON, division master mechanic at Moose Jaw, Sask., retired.

H. E. ALLAN, general locomotive foreman at Alyth, Alta., appointed division master mechanic at Moose Jaw, Sask.

R. A. BAKER, locomotive foreman at South Edmonton, Alta., appointed general locomotive foreman at Alyth, Alta.

H. I. SINCLAIR, shop foreman at Alyth, Alta., appointed locomotive foreman at South Edmonton, Alta.

Elgin, Joliet & Eastern

ROBERT H. CHEVILLE, car foreman at Joliet, Ill., retired.

ROBERT A. ROBOWSKI, car foreman at Kirk Yard, Gary, Ind., appointed car foreman at Joliet, Ill.

LOUIS J. VERBICH appointed car foreman at Kirk Yard, Gary, Ind.

Missouri Pacific

WILLIAM R. SUGG, mechanical superintendent, Western District, Kansas City, Mo., retired.

W. F. DUNCAN, acting mechanical superintendent, Gulf District, Palestine, Tex., appointed mechanical superintendent, Western District, Kansas City, Mo.

H. B. BANEY, returning from leave of absence, resumes as mechanical superintendent, Gulf District, Palestine, Tex.

New York Central

New York

K. S. WEAVER appointed assistant supervisor personnel—mechanical.

L. R. RAETHER appointed assistant supervisor locomotive maintenance.

Norfolk & Western

Portsmouth, Ohio

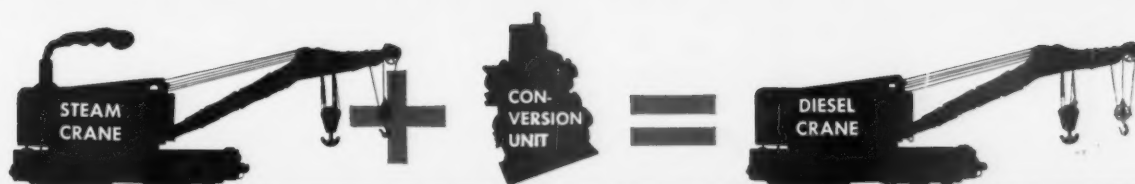
C. A. REINHARD, general foreman, retired.

WALTER E. PIERCE, back shop foreman, appointed general foreman.

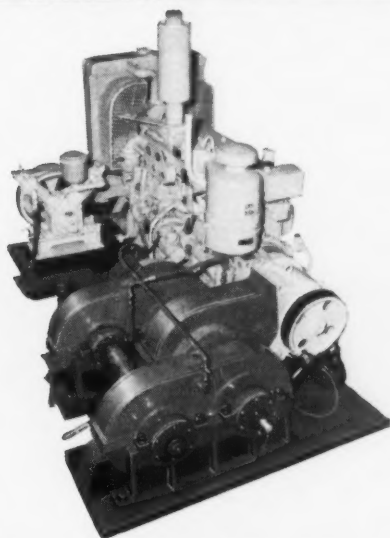
Lamberts Point, Va.

RICHARD A. ROBINNET, day roundhouse foreman, retired.

(Continued on page 20)



HOW SUBSTANTIAL SAVINGS IN LOCOMOTIVE CRANE FUEL COSTS ARE BEING MADE WITH THESE STEAM-TO-DIESEL CONVERSION UNITS



The economy of diesel engine operation is such that, with savings on both lower fuel and lower maintenance costs, the initial expenditure on a Brownhoist Diesel Conversion Unit is soon amortized. Brownhoist Conversion Units are engineered to the individual requirements of your crane. The component parts consist of the diesel engine, the torque converter, the roller bearing mounted friction clutches, and the air compressor . . . all mounted on a heavy one-piece slab base ready for installation. These units are completely assembled and tested before shipment to you, and the conversion bill-of-material becomes a permanent part of your crane record, to expedite future service. Write today or contact your Industrial Brownhoist representative (give crane serial number).



**THIS 1925 150 TON WRECKER
WAS STEAM, IS NOW DIESEL
RESULT:**

LOWER OPERATING COSTS

This Brownhoist 150 Ton Steam Wrecking Crane, built in 1925, was recently adapted to diesel with one of our conversion units. Its operators report a substantial savings in maintenance and fuel bills, more than justifying the cost of conversion.

BROWNHOIST

BROWNHOIST MATERIALS
HANDLING EQUIPMENT
GIVES A LIFT TO
AMERICAN INDUSTRY



SUBSIDIARY OF



INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN • DISTRICT OFFICES: Philadelphia,
Washington, Cleveland, Chicago, San Francisco, Montreal
AGENCIES: Detroit, Birmingham, Houston



Why Electro-Motive is expanding facilities 42% at La Grange

According to the best projected census and economic growth figures available, if the railroad industry only maintains its *present* share of the total passenger and freight business in this country, there will be forty per cent more passengers and ton-miles to be hauled by American railroads in 1966. And there are many signs that the railroads' share of the total market could rise well above this figure.

By expanding facilities now, Electro-Motive will be in a position to serve you better, to help you anticipate your in-

creasing motive-power requirements, keep pace with the demands of an expanding economy.

Thus, whether it's new and ever better standard locomotive units, re-manufacture and upgrading of older units, research and development of entirely new engines and other railroad products, Electro-Motive is in a better position than ever to support your position in the transportation field. It's our way of saying, "We have great faith in your future".

1 BASIC MANUFACTURING AREA

Over 17,000 Diesel-electric units have been produced in the plants of Electro-Motive. Today, they are operating 20 million switcher yard-hours, hauling almost 2 billion passenger train-car miles and nearly 900 billion ton-miles every year.

2 LOCOMOTIVE RE-MANUFACTURE

Pioneered by Electro-Motive, this new service is saving the railroads millions of dollars in reduced operating costs by upgrading horsepower ratings and general complete modernization.

3 PARTS CENTER

This complete warehouse stock services the other six warehouses and serves as a Midwest warehouse also. These complete facilities

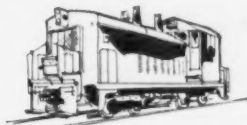
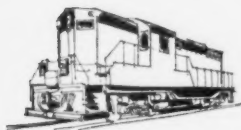
have been designed and enlarged to help you keep your motive power operating at top efficiency all the time.

4 RESEARCH AND DEVELOPMENT CENTER

From the time the first Diesel became a reality, this facility has worked tirelessly to bring the General Motors Diesel-electric to the brilliantly engineered piece of equipment it is today. More improvements, more new products are on the way.

5 NEW MANUFACTURING FACILITIES

This represents the new investment in our future, so closely allied to yours. In this way, we insure the extension of our program of continuing high quality and improvement, new design, better services to the nation's railroads.



ELECTRO-MOTIVE DIVISION GENERAL MOTORS

LAGRANGE, ILLINOIS • HOME OF THE DIESEL LOCOMOTIVE
In Canada: General Motors Diesel, Ltd., London, Ontario

PERSONAL MENTION

NGW (Continued from page 16)
Lamberts Point, Va.

DAVID BLANFORD, night roundhouse foreman, appointed day roundhouse foreman.

H. C. BRADLEY, assistant roundhouse foreman, appointed night roundhouse foreman.

Virginian

L. C. KIRKHUFF, superintendent motive power, Princeton, W. Va., retired.

W. W. OSBORNE, assistant superintendent motive power, appointed superintendent motive power, Princeton, W. Va.

W. A. GRIGG, master mechanic, Victoria, Va., appointed assistant superintendent, Princeton, W. Va.

R. R. MCDANIEL, general foreman, Mullens, W. Va., appointed master mechanic, Norfolk division, Victoria, Va.



W. A. Powers

AIR-MAZE CORPORATION.—William A. Powers has been appointed railroad representative, with headquarters at 6459 North Sheridan Road, Chicago.

RUST-OLEUM CORPORATION.—Alfred P. Emery has been appointed railroad sales manager of John N. Thorp Company, Brooklyn, and will supervise sale of Rust-Oleum protective coatings and Molub-Alloy to the railroad industry.

AMERICAN BRAKE SHOE COMPANY.—A new Railroad Products Division unites all divisions of American Brake Shoe serving the railroad industry. Included are the railroad product facilities of the Brake Shoe & Castings Division.

(Continued on page 74)

Supply Trade Notes

FAIRBANKS, MORSE & CO.—P. R. Flood has been appointed general manager of the Beloit, Wis., works, succeeding W. E. Watson, resigned. Mr. Flood was previously manager of the Pomona Works.

C & D BATTERIES, INC.—Eugene L. Krauss has joined Mark C. Pope Associates, Atlanta, Ga., sales representative for C & D.

FRANKLIN BALMAR CORPORATION.—Frederick S. Ball has been elected president, succeeding George W.

Alcock, who has retired. Mr. Ball was formerly associated with the engineering departments of the General Steel Castings Corporation and SKF Industries.

BULLARD COMPANY.—Bullard has acquired the complete line of Hydra-Feed automatic lathes from the Hydra-Feed Machine Tool Corporation of South Norwalk, Conn., and Detroit. The manufacture, sales, and service of the Bullard Hydra-Feed lathes, as they will be known, will be handled in the Bullard plant at Bridgeport, Conn., in addition to the regular line of Bullard machine tools.



For Progressive Railroading



MILLER
CENTER FEED LUBRICATOR

- Volume quantities—immediate delivery
- Cost—\$40 per carset (for all sizes)
- Life expectancy—6 years

MILLER LUBRICATOR CO., WINONA, MINN.

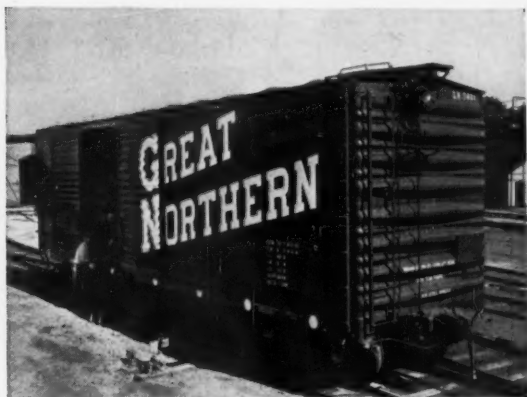


Laying and welding N-S-F in one of 800 new boxcars at Great Northern's St. Cloud, Minn. shops.

N-S-F* helps THE



BUILD FOR THE FUTURE



Railroad inspector giving N-S-F a final check as new Great Northern boxcar rolls off the road's final assembly line at St. Cloud.

Cars equipped with **NAILABLE STEEL FLOORING** enable progressive railroads to furnish shippers with Class A cars for all kinds of ladings—and safer cars, too, for shippers' personnel. Moreover, N-S-F is a flooring that can make for substantial savings over the years in both original investment and maintenance costs. It is equally economical in either new or used cars. Pertinent, timely performance and cost studies are available from N-S-F representatives in Chicago, New York, Philadelphia, St. Louis, Cleveland, San Francisco, Minneapolis and Atlanta. In Canada, N-S-F is made and sold by International Equipment Co., Ltd., Montreal.

N-S-F (TM): NAILABLE STEEL FLOORING
Made and sold by—

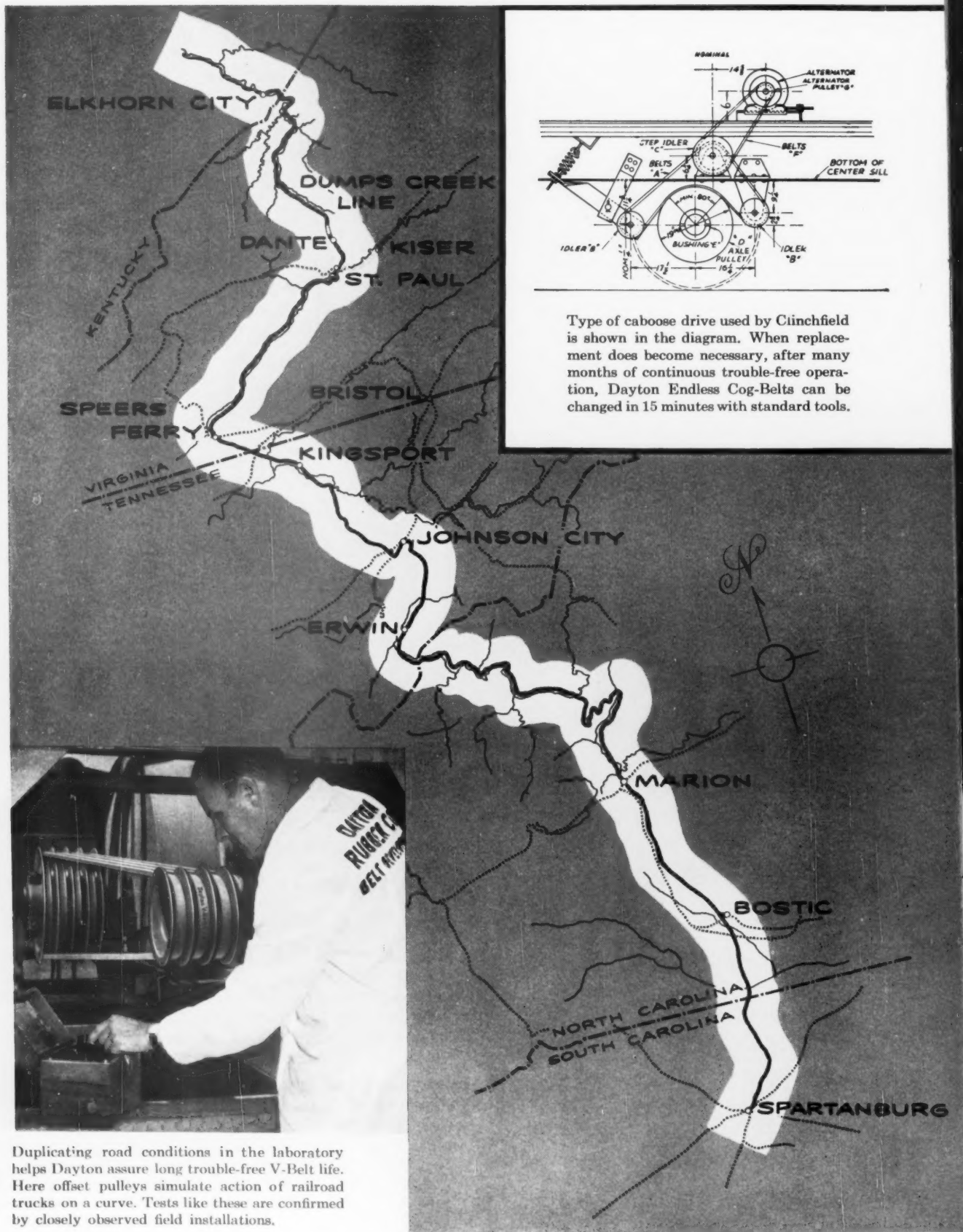
STRAN-STEEL CORPORATION

Detroit 29, Michigan • A Unit of



NATIONAL STEEL CORPORATION





Duplicating road conditions in the laboratory helps Dayton assure long trouble-free V-Belt life. Here offset pulleys simulate action of railroad trucks on a curve. Tests like these are confirmed by closely observed field installations.

Type of caboose drive used by Clinchfield is shown in the diagram. When replacement does become necessary, after many months of continuous trouble-free operation, Dayton Endless Cog-Belts can be changed in 15 minutes with standard tools.

V-Belt drives give full Radio Power on America's most sharply curved Mainline Road

110 miles of curved mainline track; yet Dayton caboose drives deliver long, trouble-free low-cost service.

Radio communication—between Engineer, caboose and wayside—was part of the modernization program on the Clinchfield Railroad. Some method of driving the caboose generators was needed that would deliver full, continuous power at all times. It had to combine low initial cost with minimum maintenance.

An excellent proving ground for equipment, the Clinchfield twists tortuously for 276 miles through the mountains of North Carolina, Tennessee, Virginia, and Kentucky. (Connecting with the Atlantic Coast Line and the Chesapeake & Ohio Railway, it helps provide 3rd morning delivery of perishables from Florida to Detroit.) Longest single stretch of straight track is two miles. Of the 276 miles, 110 have some degree of curvature—many of them 10 to 14 degrees.

Clinchfield's engineering staff, headed up by Chief Engineer J. M. Salmon, Jr., Signal Engineer W. E. Prince, and assisted by Superintendent, Machinery P. O. Likens, studied both direct

drives and several types of V-Belt drives. They knew their railroad and the demands it made on equipment. They chose the Dayton V-Belt Caboose drive for its relatively simple design.

With the help of Dayton Field Engineers the first installation was made in November, 1955. Experience showed a need for only minor adjustments. Every mainline train is now equipped with two-way radio. Forty drives were installed.

Service, according to the men of Clinchfield, is even better than expected. The drives have given the dependable, economical source of power needed. And despite operation on sharply curved tracks, they have provided continuous trouble-free service.

Dayton V-Belts can give you the same month-after-month low maintenance service. Help in the solution of your drive problems will be gladly provided by the Dayton Railway Field Engineer. Write The Dayton Rubber Company, Railway Division, Dayton 1, Ohio.

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AiResearch turbochargers now available have been designed on this principle—which promises to be universal in the future. In addition,

our units increase power up to 100% depending on design and application of your engine, cut fuel costs, reduce noise and decrease or eliminate smoking. The removable rotating assembly

makes them easier to maintain than other turbochargers.

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BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min.	25-40	35-65	35-65	70-95	115-175
(Standard Conditions)					



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If you are having trouble with shunts jarring loose or being pulled out, we suggest you try USG Brushes with Statite. Statite is a permanent shunt connection needing no hammerclips. It can't be jarred out even under severe operating conditions, and will assure your electric motors of steady maintenance-free performance. Statite eliminates the need for riveted shunt connections. In addition,

Statite shunt connections retain their original low millivolt shunt drop, cannot oxidize, and are unaffected by temperature extremes. USG Brushes are manufactured in a variety of types and sizes for all applications from fractional horsepower to diesel generator. Grades available include carbon and carbon-graphite, electrographitic, graphite, metal graphite, and silver graphite.

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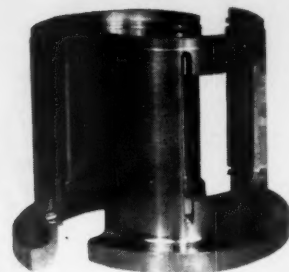
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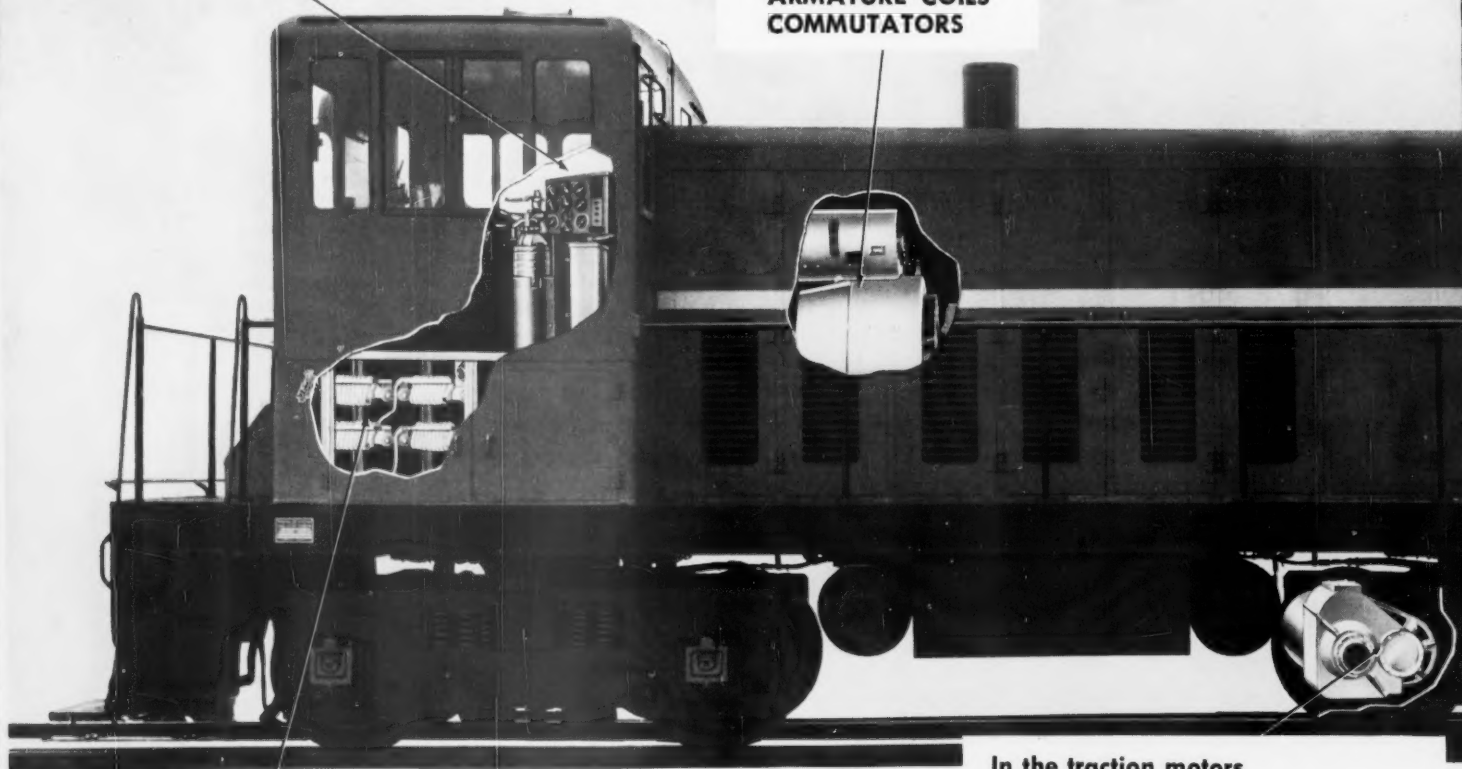


3 MOTOR SUSPENSION BEARINGS give longer service life, have built-in oil-return feature for savings up to \$85 of operating costs per locomotive unit, each year.

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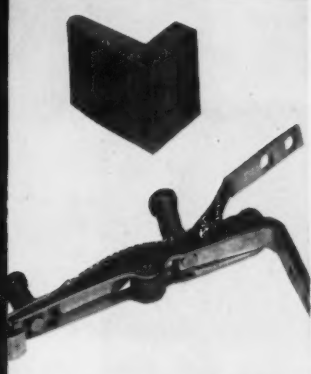
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CONTACT PARTS

In the traction and
auxiliary generators
**BRUSHES
ARMATURE COILS
COMMUTATORS**



In the reverser and
field shunting equipment
**CONTACT PARTS
RESISTORS**

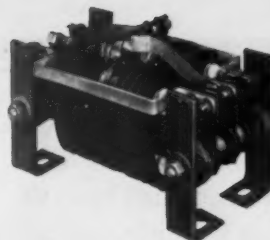
In the traction motors
**BRUSHES
ARMATURE COILS
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COMMUTATORS
MOTOR SUSPENSION BEARINGS**



4 CONTACT PARTS break circuits quickly with minimum metal transfer, giving long service life from these parts.



5 RECOMMENDED CARBON BRUSHES, selected for proper degree of hardness and grain structure, minimize wear and tear on commutator surfaces.



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7 COMMUTATORS, seasoned by high speed, high temperature process, wear longer and retain smoothness.

You Originally Bought 7 Key Replacement Parts

Seven key parts are vital to the steady, dependable performance of your locomotive electrical equipment. That's why when you replace these key electric parts in your General Electric equipped locomotives, you'll want only G-E parts to help you keep all the power that you originally bought.

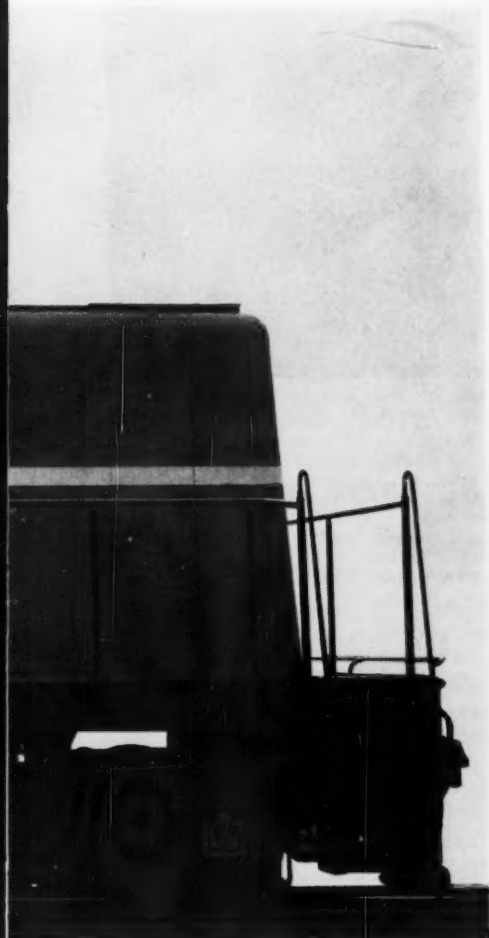
General Electric's 7 key replacement parts are precision-built to original parts specifications. Each one is manufactured to include the most recent design and engineering advancements. When you use these parts, you'll be helping the electrical components in your locomotives to meet the most modern and efficient standards of operation.

This means, of course, that you'll reduce maintenance costs too. You'll get many locomotive work-miles between parts replacements, and you'll save time by ordering all of your parts from one established supplier who will always have the parts that you need. By specifying General Electric replacement parts, you'll get long parts life, improved locomotive performance, and top value for your replacement dollar.

For all of your G-E equipped locomotive parts needs, contact your nearest General Electric Parts Center or your locomotive builder. For additional information on why G-E parts and parts services are best for you, write for our new brochure, Section 128-40, General Electric Locomotive and Car Equipment Department, Erie, Pa.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**



**The world of science behind
EXIDE-IRONCLAD BATTERIES**



Being interviewed is W. W. Smith, Divisional Manager, Product Engineering. Grids in back are of Exide's exclusive Silvium. Those in front are ordinary alloys.

"All of these alloys had the same acid test"

At the Exide Laboratories— **Reporter:** Was it a typical charge-discharge test normally used to test battery components?

Smith: Right. And the two positive plate grids with no visible signs of corrosion are Exide's patented Silvium alloy.

Reporter: How about the others—what alloys are they?

Smith: They're standard alloys used in other well-known makes of batteries. But they don't have Silvium's corrosion-resisting ingredients.

Reporter: Where is Silvium used?

Smith: In the positive plates of all Exide-Ironclad and many other Exide Batteries.

Reporter: How does it affect battery performance?

Smith: Every test we've made proves it stretches battery life because the grid resists corrosion—sometimes up to 100% longer.

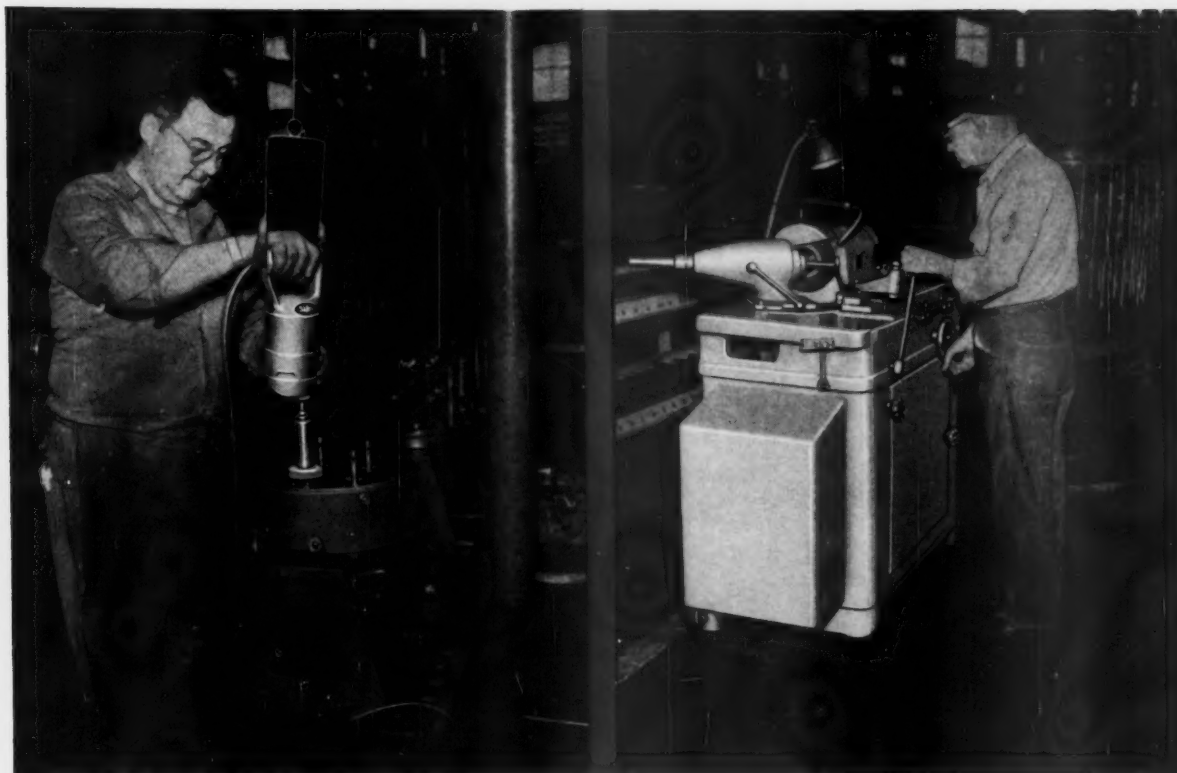
Reporter: Obviously this is an important feature of the Exide-Ironclad.

Smith: Yes it is, but it's just one of many engineering details that contribute to its high capacity and long life.

Note to battery users: Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For detailed bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.



THE ELECTRIC STORAGE BATTERY COMPANY **Exide**[®]



CONVEYOR AND SIOUX SPEED VALVE GRINDING!

Pictured above, left, is a scene in the Chesapeake & Ohio Railroad, Huntington, West Virginia, Diesel Locomotive Shop. The operator is using a Sioux Heavy Duty Portable Driver, and a Sioux Stone Grinding E.M.D. Liner Head Valve Seats. The Sioux Driver is lowered from a retractor hanger. Liner Heads are held in shop-made positioners which are moved along the assembly line conveyor.

Diesel Engine manufacturers recommend Sioux Valve Seat Grinding Equipment. Factory approved sets include Allis-Chalmers, American-Locomotive, Baldwin Locomotive, Case Tractor, Cooper Bessemer,

General Motors Corp., Hercules Engines, International Harvester Trucks and Tractors, John Deere Tractor, Massey-Harris Tractor, Minneapolis-Moline Tractor, National Supply, Oliver Tractors, Onan Engines, Reo Motors, White Motor Trucks.

The new Spline Drive now being supplied, gives from ten to twenty times the life of the hex drive, and is more accurate.

A Sioux 682L Valve Face Grinding Machine is shown above, right, in operation in the Chesapeake & Ohio Railroad, Huntington, West Virginia, Diesel Shop.

More Sioux Valve Grinding Machines are in use than all other kinds combined. No other machine compares with the Sioux 682L in ruggedness, precision, and ability to do the big jobs.

Your nearest Sioux Distributor is listed in the yellow pages under "Portable Electric Tools".



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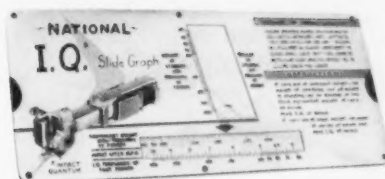
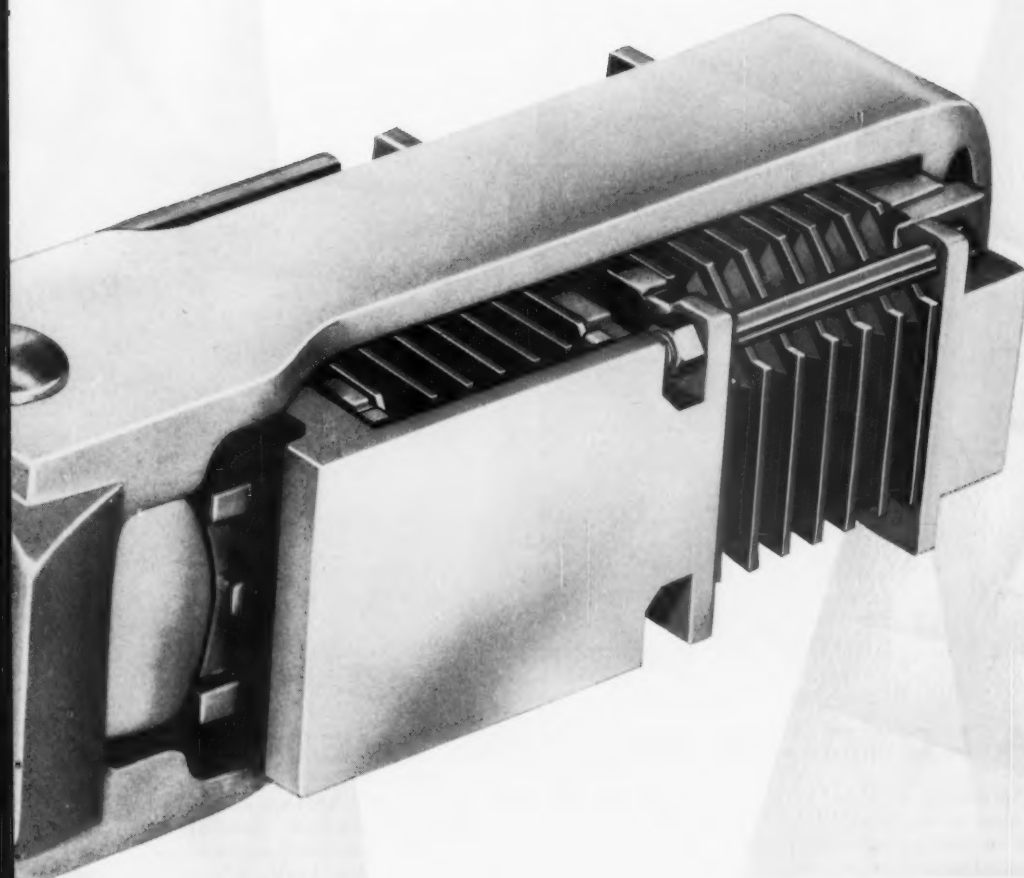
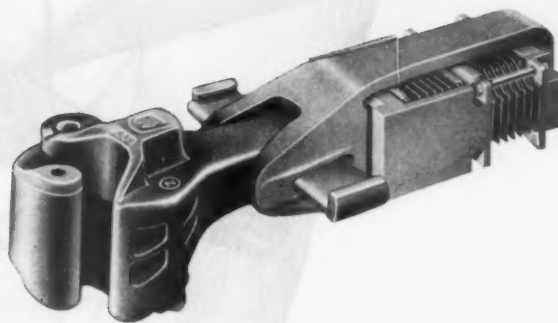
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*There's Improved Railroading with
National Specialties*

REASON:

National's MF-400 Rubber-Cushioned Draft Gears have a rated capacity of 42,500 foot pounds, *plus* a reserve capacity 54 per cent greater than the rated — *65,500 foot-pounds!* This reserve capacity guarantees the original rated capacity at the original force level over a longer period of time than possible with gears that have definite solid points at their rated travel.





AA-3536

NATIONAL'S IQ SLIDE GRAPH

(Available upon request)

Shows total work done in foot-pounds during impacts between various cars at various speeds! Shows how much of this work National Draft Gears account for at various force levels! Points up need for high capacity in draft gears!

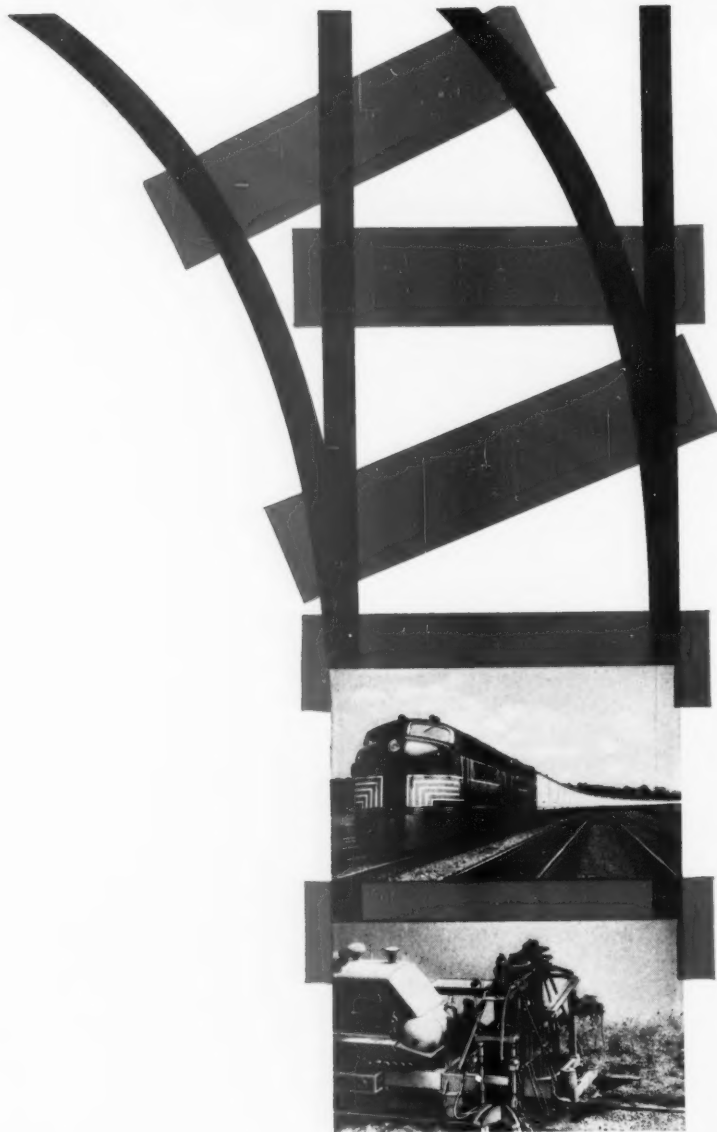
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Skilled Esso technicians are ready to analyze your petroleum needs and recommend the best fuel or lubricant for your diesel equipment. For information or technical assistance, call your local Esso office, or write: Esso Standard Oil Company, Railroad Division, 15 W. 51st Street, New York 19, N. Y.



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“backseat driver”
pays his way**



THIS MAN in the brown suit is a "backseat driver," but he's welcome wherever he goes. He's a Westinghouse Air Brake Service Engineer checking the performance of an installation of Westinghouse Air Brakes.

He has ridden thousands of miles at the business end of all types of trains.

He knows air brakes, as he must, to adequately appraise their operation and maintenance.

He's thoroughly trained and experienced. He


will see to it that your braking system operates to meet your exacting requirements.

Westinghouse Air Brake Service Engineers, like this man, are on call all the time to check a new installation or consult with you regarding air brake matters.

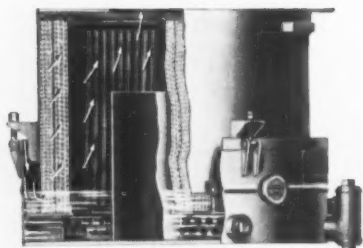
They roam the country, and the world, for one purpose: to make sure that Westinghouse Air Brakes operate correctly, dependably and efficiently.



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"One Air-Maze oil bath air filter has saved \$4385.79 in 27 months!"



HERE are the dollar-and-cent results of a leading midwestern railroad's 27-month test of an Air-Maze oil bath air filter. These results show the sound, economical reasons why dozens of top-flight railroads are switching to Air-Maze oil bath filters for air intakes on hundreds of diesels in freight, passenger and switching service. These are the facts from the actual report:

"Savings with Air-Maze oil bath filter for 27-month period from December, 1953 to April, 1956, are:

<i>Reduced cost of power assembly change-outs</i>	<i>\$2880.00</i>
<i>Reduced cost of servicing</i>	<i>1505.79</i>
<i>Total savings for 27-month period</i>	<i>4385.79</i>
<i>Annual savings</i>	<i>1949.24</i>
<i>Rate of return on investment for oil bath filter</i>	<i>354%</i>

Formerly the engine was equipped with panel filters that had to be cleaned and changed once a day. The oil bath filter needs servicing only once every three months. Equally outstanding are the facts about the Air-Maze oil bath filter's efficiency. The oil bath filter is effective at *all* engine speeds—does not

depend on high air velocity to do a top filtering job. It works effectively at low pressure loss . . . is not affected by humidity or oil mist conditions.

According to recent, extensive testing by an independent laboratory (which was selected not by Air-Maze, but by one of our customers), the Air-Maze oil bath filter removes 59% more fine Arizona road dust than the next best filtering device in use today.

If you want to cut both *filter* and *engine* maintenance costs as well as extend power assembly life, it's time to equip your diesel locomotive with Air-Maze oil bath filters. For further information, see your locomotive builder or write the Air-Maze Corporation, Cleveland 28, Ohio.

* Additional data furnished on request.

The biggest names in diesels are protected by Air-Maze filters

ENGINE AIR FILTERS
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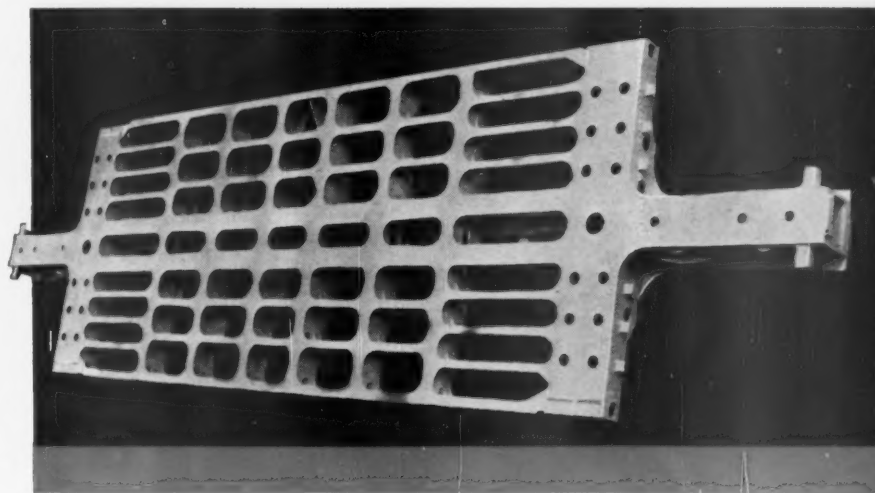
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New Santa Fe Ore Cars with Maintenance-Free Commonwealth One-Piece Underframes will withstand heavy punishment!

These Santa Fe ore cars are sure to stand up under the *rugdest* kind of service—the handling of copper ore—and remain in continuous operation! These new high capacity cars have clasp brake trucks with 6½ x 12 axles. They're specially designed with Commonwealth one-piece cast steel underframes providing exceptional strength at minimum weight, and assuring maximum availability—increased revenue.

The greater impact value of cast steel and the one-piece underframe design withstand ore loading impact better than other types of construction. Our years of experience in the design and production of Commonwealth Underframes have resulted in the elimination of costly maintenance.



Whether you require ore cars, flat cars, pulpwood cars, sulphur-carrying cars, well cars or depressed center cars, build with Commonwealth Underframes—and benefit from these advantages.



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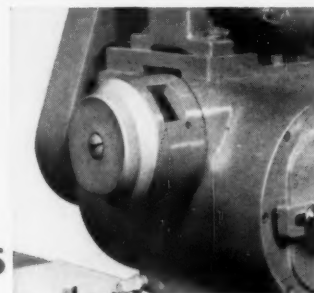
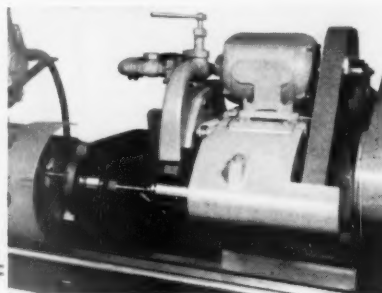
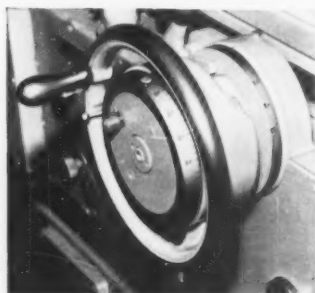
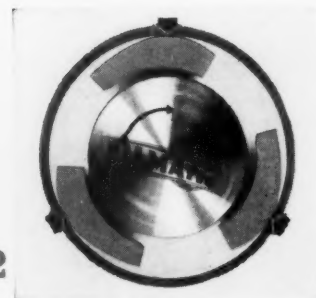
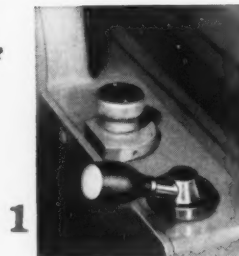
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Small manufacturing quantities may be good for inventory accounting, but they're tough on costs. In precision toolroom grinding, CINCINNATI® FILMATIC Universals offer several ways to eliminate or greatly reduce the setup element of cost.

- 1** Power rapid positioning of wheelhead. Saves time and energy, especially when setting up for widely varying diameters (extra equipment).
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Other ways in which new CINCINNATI FILMATIC 12", 14", 18" Universal Grinders can reduce costs in your shop are outlined in catalog No. G-663-1. May we send a copy to you? You will find brief specifications in Sweet's.

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Rock Island ordered fifty Adapto flat cars. Containers delivered included sixty 17-ft boxes, twenty 17-ft gondolas, and ten 35-ft boxes.

Let's Look At These Four-Wheelers

Rock Island is now operating nearly 50 "Convert-A-Frate" cars arranged for handling demountable cargo units; others of these ACF Adapto's are under test in "Truc-Train" service on Pennsy.

ACF Adapto is on its way on the Rock Island. By the end of the year, the road was operating 43 of these cars in revenue service. These RI cars are arranged to handle the removable gondola and box units which were also supplied by ACF. After delivery, the Rock Island built automobile carriers for the cars, and encouraged the construction of a refrigerated box which is now in use. These Adapto cars are also being tested in piggy-back trains on the Pennsylvania.

The car itself is a radical departure. Until nearly the turn of this century, there were many four-wheel coal cars in service on numerous American railroads. There seems to be little doubt that this newest fleet is the largest group of four-wheelers built and success-

fully operated in revenue service here in many years.

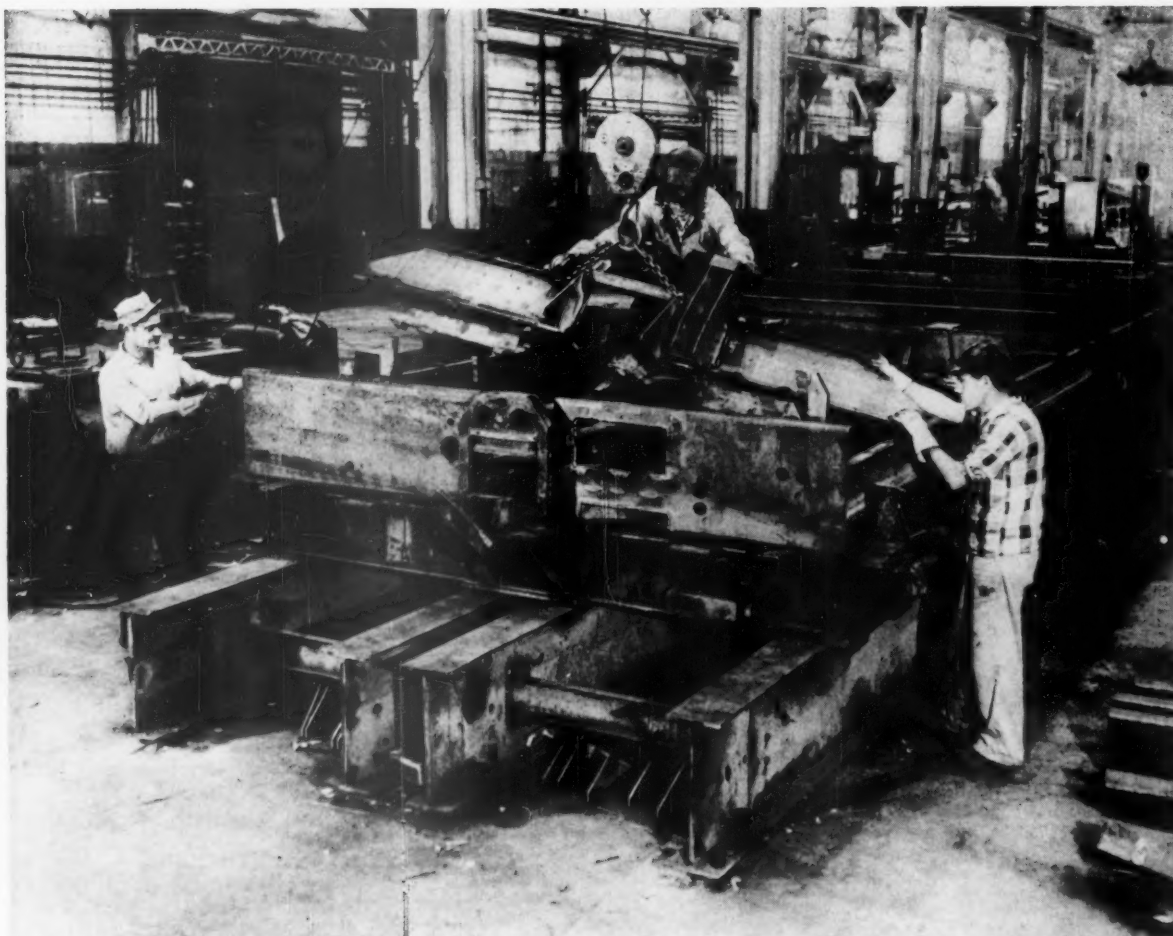
The center sill for this car is composed of two 41.2-lb AAR Z-26 sections extending the full length of the car. This sill is reinforced along its center 12 ft with a $\frac{3}{8}$ x 5-in. bar welded under the joint between the two Z sections. A $\frac{3}{8}$ x 2½-in. bar is welded on the top surface of each of the bottom flanges of the center sill for the same 12-ft length.

Side sills are 9-in., 13.4-lb LAHT channels which are connected to the center sill by eight 10-in., 15.3-lb channel cross bearers and by two ¼-in. pressed end sills 19-in. deep. There are eight diagonal braces made of the same channels which are used for the side sills. These braces form an "X" in each of the floor panels between the cross bear-

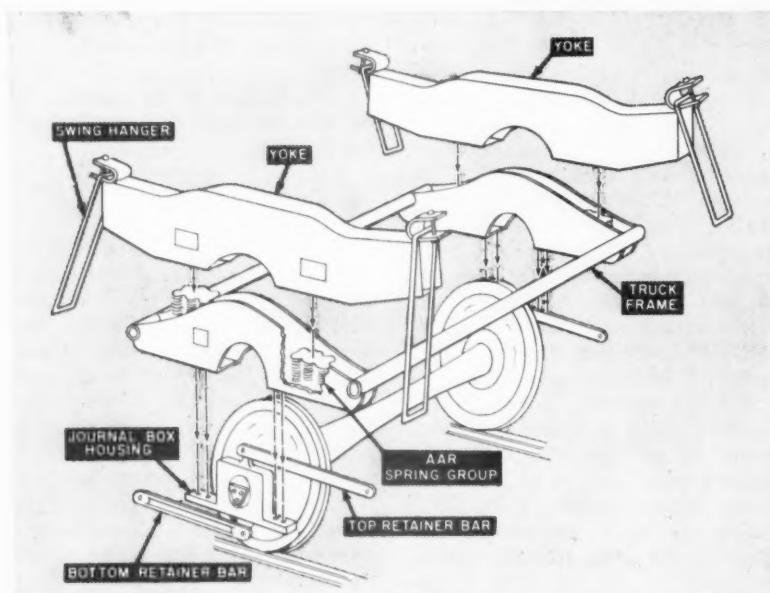
ers just inboard of the trucks. The entire underframe is a welded assembly.

Self-Clearing Floor

The flooring is 2¾ x 5½-in. treated decking spaced to be self-clearing. This decking does not extend the full width of the car, but only out from each side of the center sill. The top of the decking is flush with the top of the center sill. It is attached to angles on each side of the center sill, to channel-type floor stringers, and to the tops of the side sill channels with ½-in. Nelson end-welded studs and watertight nuts. At the four points where the forks of the lift trucks contact this platform in unloading the 17-ft containers, the deck is floored with



Cross bearers are channels which run under the side and center sills. Jig holds inverted underframe during assembly.



Single-axle truck supports the car body on four swing hangers as illustrated in this Railway Locomotives and Cars sketch.

pressed steel channels instead of the wood used over the remainder of the surface.

The Waugh twin-cushion draft gears are applied in the conventional manner at the ends of the center sill. Forged rear draft lugs are riveted into the sill, while the combined striker and front draft lug assemblies are welded in at the ends. The cars have bottom-operated, Type F, interlocking couplers. The top of the car's deck is just above the top of the couplers, just $41\frac{7}{16}$ -in. over the rail.

Adapto Truck

The Adapto single-axle trucks applied to these cars are connected to the body through swing hangers supported at brackets on the cross bearers. This swing-hanger suspension is a departure from the arrangement previously used on American

four-wheelers which have usually had their two single axles guided in pedestals fixed to the car body. The loop-type swing hangers are inclined to make the Adapto truck self centering while permitting some lateral motion between it and the body.

The Rock Island cars have AAR standard 6 x 11-in. Bethlehem axles and 33-in. Southern one-wear cast-steel wheels. Axles are equipped with Timken AP roller bearings. Each roller bearing assembly is carried in a cast steel housing under a Fabreka pad.

Each truck frame is composed of two side frames connected by two 4-in. steel pipes. The journal box housings are bolted into the side frames which are pressed from $\frac{3}{4}$ -in. plate and are shaped to provide space for two groups of standard AAR coil springs—one group on each side of the journal housing. This makes a single unit out of the wheel and axle set, the journal bearings and housings, and the truck frame.

The coil spring suspension of each truck is four nests of five coils each. These are the AAR 1947 alternate standard design springs with $3\frac{1}{16}$ -in. travel. Resting on the two spring groups on each side frame is a $\frac{1}{4}$ -in. steel pressed yoke which has the truck swing hanger brackets applied at each end. This yoke also has the bracket for the transverse yoke retaining bars.

The axles are kept at right angles to the car's longitudinal center line through the upper and lower retainer bars applied to the truck side frame. The lower bar on each side is fastened to the end cross bearer of the body, and the upper bar is pinned to an intermediate body cross bearer. These yokes are kept in lateral alignment within the side frames through yoke retaining bars attached to the yoke and to the tubular side frame connecting members. All of the pins in these aligning mechanisms are carried in rubber-mounted bushings requiring no lubrication. Attached to the inboard side-frame connecting member of each truck are two Monroe, strut-type hydraulic shock absorbers which are then fastened to the adjacent body cross bearer.

Brake System

The Rock Island cars have Westinghouse AC brake equipment actu-

ating individual truck-mounted cylinders on each wheel. Each cylinder then operates a single Cobra brake shoe against the wheel through a lever pivoted at the side-frame connecting member. Despite the individual cylinders, the cars have Creco #18 brake beams, loop-type brake hangers, and the conventional wear plates and safety supports.

The light weight of the car is 27,000 lb. The length over end sills is 38-ft, the width over side sills is 9-ft 4-in., and the wheel base is 27-ft. The capacity is 70,000 lb and the load limit is 77,900 lb.

In addition to its containers, ACF has been developing high-speed anchoring mechanisms to attach these demountable bodies to the car. Also developed is a retractable trailer hitch for cars assigned to piggy-back service.

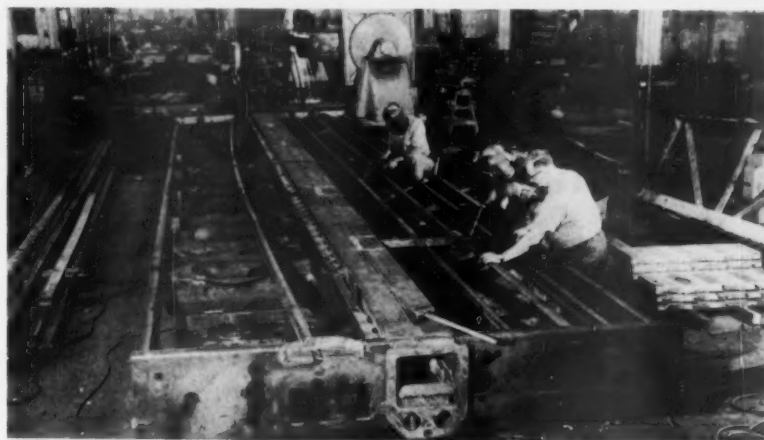
Rock Island Experience

When the Rock Island first put its "Convert-A-Frates" into service,

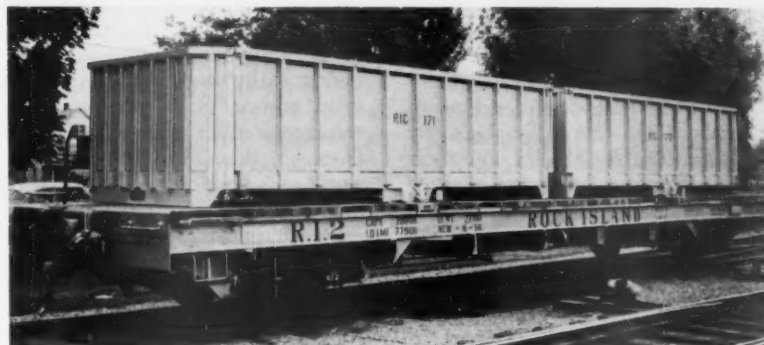
they were hauled near the rear of trains. Today these four-wheelers are handled at any location throughout a train. The road has experienced no derailments, and imposes only a normal speed restriction when moving them through sharp turnouts. There have been no tests made with these cars in hump classification yards.

Rock Island test department studies have shown good vertical ride characteristics. The cars are handling a twice-weekly meat run from St. Joseph to Chicago. This meat is handled from the Swift & Co. plant in the plastic refrigerated unit equipped with meat hooks. There have been no cases when meat tore through the hooks—an indication of the riding qualities.

Rock Island inspections have shown the welded truck assembly has been satisfactory; a point of concern when the cars were first delivered. From a mechanical standpoint the entire truck was found to be in excellent condition.



Three floor (above) stringers support the wood decking between the center and side sill on each side of the car.



Another type Adapto container on flat car.



Auto transporter has length of 78-ft. During design the idea of side loading was discarded; car has only end doors.

An "overgrown box car" . . .

How CNR Automobile Transporter Was Developed

Not satisfied with compromises represented in conventional automobile cars, Canadian road went all out to design special "automobile transporter" and now owns 25 such cars.

The Canadian National has started revenue service with twenty-five double-deck automobile transporters. These big 78-ft cars are in service between the Canadian automobile assembly plants in southern Ontario and destinations in Eastern Canada. The cars were built by Canadian Car & Foundry, and their delivery is the culmination of three years' efforts by the research and development department and by the mechanical department of the CNR.

The project was started when CNR management became concerned about the road's competitive position in the movement of new

automobiles from factories to dealers. Even though the door arrangement and dimensions of the standard automobile car vary from those for the standard box car, the automobile car is really designed to spend a good portion of its time handling shipments other than automobiles. Even so, the CNR finds that the width and position of the doors of the conventional automobile car make it unsatisfactory for such services as the movement of loose grain. At the same time the loading of automobiles in such cars is complicated, time consuming and expensive. These factors are reflected in

rates which must be charged for the movement.

The project assigned to the CNR research and development department was a study of the handling of automobiles in the conventional automobile cars, and of the possibilities and economic advantages of moving this traffic in specialized cars. The specialized car study expanded. Economic studies of capacity indicated that a car carrying eight automobiles promised the greatest return on investment. During the study, cars which could handle four and six automobiles were considered. Gradually the au-



Sliding floor assemblies—four on each deck—provide shock protection to automobiles anchored on them.

tomobile transporter was taking form. The decision was made to attempt to design such a special car.

Once the decision was made, these general design principles were established:

1. Automobiles should be completely protected from weather.
2. Capacity of the "transporter" would be eight automobiles.
3. Outside dimensions of the "transporter" should not restrict movement of the car on most of the main lines and industrial sidings of the CNR in Canada. The car would not be designed for general interchange service.
4. For loading and unloading, automobiles should be driven on and off the "transporter" under their own power.
5. Securing automobiles on the car had to be done rapidly and in a manner which would protect them from damage.

When it was determined that the car's capacity would be eight automobiles—instead of four or six—Research and Development considered a number of radical arrangements in an attempt to keep the car's length to a minimum. "Tilted" loading was found to require an involved mechanism, and the overall length of today's automobiles would not permit enough angling to significantly shorten the car.

Having decided to use horizontal loading, consideration was given first to a depressed center, and also to depressed runways to lower the automobiles even further. The depressed center of the car would permit an upper deck over this area without exceeding the height of the standard freight car. But during unloading, automobiles would still have to move off over the bolster and car-end construction which could not be lowered. The depressed center was then discarded, and a two-high flat deck arrangement with a minimum clearance of nearly 6-ft over each deck was adopted. The car's overall height would be greater than that of standard cars.

The car was beginning to take form. The basic automobiles to be hauled are assumed to have an overall length of 18-ft, a width of 6-ft 10-in., and a height of 5-ft 6-in., and represent the typical medium priced models. The design was calculated for automobiles weighing 4,500 lb. With the requirement that there be complete weather protection, it was established that the car would be of the box car type. This allowed the use of many conventional box car components and much of the design duplicates arrangements standard with box cars. The car body is just over 10-ft wide because of its length. Design constants were longitudinal accelera-

tions of 8 G for dead loads and 4 G for live loads. Vertical and lateral accelerations were each assumed to be 1 G for dead loads and ½ G for live loads.

The underframe is 75-ft 8-in. over the welded strikers and is built around two AAR 41.2-lb center sill sections. Each of the body bolsters is of the double diaphragm type. The four 3-in., Z-section floor stringers are also carried on four crossbearers and on seven crossties. The car has 6 x 3½ x ⅝-in. angles for side sills and each is reinforced with a 6-in., 15.3-lb channel.

The final design has no openings in the car sides. These sides are built around 3-in. Z-section side posts which extend up to W-section, rolled side plates. Conventional 0.10-in. rolled copper bearing steel sheet is used for side sheathing. These cars are not lined and are almost completely riveted. The roof is a standard, diagonal panel assembly.

On top of each of the bolsters is a welded, two-story, rigid frame structure with vertical legs of 6-in. WF sections and with cross beams composed of ½ and ⅝-in. plate under the second deck and under the roof. The side construction described above was known to be more than adequate to carry the vertical loads when the car is loaded, particularly with the absence of side

doors. Side loads were another thing. The open ends of the car would not provide the lateral strength of conventional box car ends. The rigid frames give lateral strength to the car structure. The second deck is carried on these frames and at supports on each of the side posts.

The second deck is a "battledack" type of floor construction— $\frac{1}{4}$ -in. plate over a framing of 3-in. channels, angles and tees. The first deck is steel plate welded to the conventional underbody supports. Installed both on the first and second decks are the "sliding floor" assemblies—each capable of holding one automobile and four on each level. Each sliding floor is composed of two 18-in. x $\frac{1}{4}$ -in. steel strips spaced at the conventional automobile wheel "gauge" and separated by an angle frame. On the outer edges of the two strips are punched angles to which the automobile is fastened. Approximately opposite each wheel location on this "sliding floor" is an outrigger which anchors two extension springs. These springs extend in opposite directions toward the two car ends and are then anchored

in the car floor. This means that there are eight springs in the shock absorbing mechanism for each automobile—four effective in either direction. There are blocks on the car floor to prevent the lateral movement of the "sliding floor," and stops beyond its two ends which permit 6-in. of end movement in either direction. Tests have shown that an end acceleration of 2 G's in the car produces an acceleration of only $\frac{3}{4}$ G in an automobile anchored on this shock absorbing mechanism.

At one time during the development, considerable work was done on incorporating upper-deck loading ramps within the car. This required an elevating mechanism on these pivoted, upper deck sections, and introduced structural complications. Suitable ramps (actually two sections of the upper deck) were so long that they eliminated any possibility of side loading; and it was during this phase of the development that the end-loading principle was definitely fixed. The complete car design was well developed when a meeting with automobile manufacturers developed the fact that these

shippers would be willing to use separate, external ramps which were not part of the transporter. It was agreed that such a ramp should be portable, and easy to handle and assemble.

The ramp is arranged only to bring automobiles from the second deck level to the first deck level since all these cars will be unloaded at points which have a car-floor height, end-unloading platforms. The ramp will be assembled on that platform. It is a three-piece steel structure which can be handled by two men. By incorporating suitable vertical curves in the structure, overall ramp length was kept to a minimum.

Each end of the car is fitted with two folding doors and with a hinged threshold plate extending completely across the bottom of the end opening and completing the closure at the car end. Doors could not extend down to the end sill because it would be impossible to open them at unloading platforms. At the same time the car floor could not be raised without increasing the overall height of the car. The end doors had to be

(Continued on Page 50)



Double folding end doors were required so they could be opened between coupled transporter for "circus" loading.



Anchored for shipment, automobile is held through hub attachments on all four wheels and chains to sliding floor.

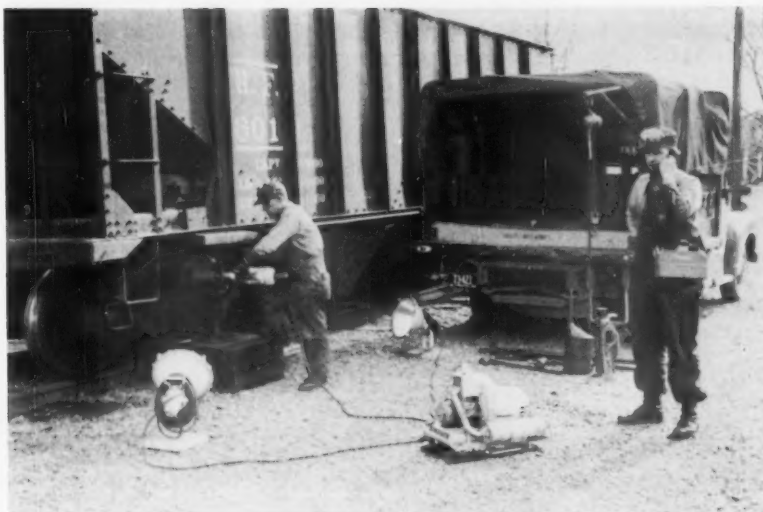


Hub attachment is key to securing autos in transporter; it accommodates all manufacturer's wheel mounting studs.



"Big boy" between conventional 40-ft box cars accents the transporter's length and 16-ft 6-in. height.

RF&P trucks carry power tools, floodlights, and a small generating plant to assist in making rapid repairs to passenger and freight cars. In some cases it has not even been necessary to set the cars out of trains.



This Car Department Keeps Them Rolling

RF&P car forces use highway trucks, radio and special tools to keep freight and passenger equipment on the move over the heavy-traffic Richmond-Washington route.

The strategic, double-tracked Richmond, Fredericksburg & Potomac extends 113 miles from Washington, D. C., to Richmond, Va. It handles all the Atlantic Coast Line and Seaboard passenger trains enroute between Washington and southern points. Freight traffic for and from the B&O and Pennsylvania at Potomac Yard is moved to and from connections with the ACL, Seaboard, C&O and Southern at the RF&P's south end. Much of the

freight traffic is perishables.

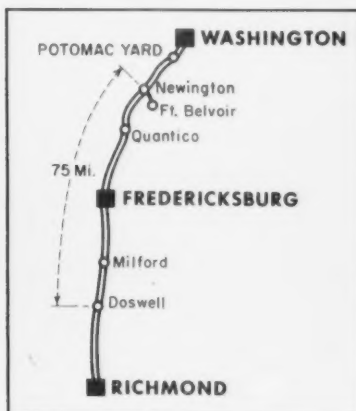
At the mid-point of this busy route is Fredericksburg, Va., where the RF&P has a highly mobile car force. This group consists of a supervisor and 12 inspectors who cover round-the-clock assignments. At Fredericksburg they work a car repair track which is equipped with flood lights for 24-hr operation. From this point radio-equipped highway trucks cover 75 miles of the 113-mi main line. Emergency or

permanent repairs are made to all freight and passenger cars set out or disabled in trains in this territory. In addition, inspection of cars and open-top loads is performed at Doswell, Milford, Quantico, Woodbridge and Newington, and for the military installations at A. P. Hill, Quantico and Fort Belvoir.

The radio equipment on the three trucks at Fredericksburg enables inspectors to communicate with the train dispatcher at Richmond, with



Supervisors and dispatchers contact Fredericksburg car inspectors along . . .



Seventy-five miles of the busy main line covered by these forces in the . . .



Three radio-equipped trucks carrying tools and parts to make rapid repairs.

locomotives and cabooses enroute, and with the mechanical department office at Fredericksburg. There have been a number of cases when car inspectors traveling in these trucks were contacted with the radio by the dispatcher or mechanical supervisor and sent to trains having difficulties along the line. Repairs that were made to cars in these trains made it unnecessary to set out the cars and avoided lengthy delays to the trains.

A similar saving is achieved because inspectors can be directed to

inspect cars and loads as soon as the supervisor has been informed by the agent at the point where the cars are located. This speeds service for RF&P customers, and produces savings in labor costs, truck mileage and truck maintenance.

Two of the trucks are fitted with body-mounted side boxes which carry journal bearings, packing, water fire extinguishers, brake rigging parts, coupler knuckles, air brake tools, and other parts and tools

needed for most rolling stock repairs. The third truck carries this equipment and material along with additional tools needed for rewheeling cars set out along the line. There are two 35-ton Duff-Norton ratchet jacks and two 50-ton Duff-Norton electric jacks. The electric jacks and two 110-volt flood lights are powered with a Homelite 2,500-watt gasoline generator. This truck also carries an oxy-acetylene cutting outfit and a demountable, portable "A" frame for car truck repairs.



Here's How To Meet Wheel Handling Problem

Toledo, Peoria & Western's Ford truck (top) for changing car wheels along the line has a yoke pivoted at each side of the bed just over the truck's rear wheels. This yoke has a sheave at its center which extends 20-in. over the end of the bed. From a winch just back of the car runs the cable which passes over the sheave to the wheel "hook". A stop on the cable at this hook means that the wheel set being picked up will be lifted vertically until the stop strikes the yoke. The yoke then moves up so that the wheels are brought in over the bed of the truck. After they are over the bed, pins lock the yoke in its nearly vertical position, and the wheels can be lowered to the truck bed.

Western Maryland's two-ton Dodge truck (center) has an Anthony 3,000-lb capacity hydraulic lift gate. Wheels rolled on to this gate while it is horizontal on the ground are lifted up to the bed of the truck. After the wheel set has been loaded, the gate moves on up to a vertical position to completely close the back of the truck body.

The Baltimore & Ohio's car department at Clarksburg, W. Va., has applied a tramrail and hand-operated hoist to a truck (bottom) for the handling of wheel sets and other heavy car material.



Moving down the line from the Magnus cleaning tank at the left, overhead tramway permits mechanized handling through every step in the process.

Here's How A Short Line Does It . . .

Cleaning Air Filters on a Production Line

Production line and short line don't always go together when referring to diesel locomotive maintenance. But the Pittsburgh & West Virginia with a total of only 26 units operates a filter cleaning production line. Filters are placed on a carrier when they start through the cleaning process and remain on it until they arrive back at the locomotive to be installed in the filter frames. All this permits rapid clean-

ing with a minimum of labor—the filter line is a one-man operation. All handling during the cleaning is done with a hoist running on an overhead tramrail which connects all the operations.

The wheeled rack used to move the filters is built to hold a set of dirty filters as well as a set of clean ones so that it is not necessary to make two trips from the filter cleaning line to the locomotive. Dirty

filters removed from the unit are placed at each end of the rack while the clean filters are taken from the carrier at its center. Height of the wheeled rack is adjustable. It is low enough to pass through shop doors. When it arrives at the roundhouse where running work is done, it is pulled up with a shop crane and locked at a height where it can be reached from the locomotive running boards.

Cleaning . . .



Filters start into cleaning tank which is also used to do the multitude of other cleaning jobs necessary in a diesel locomotive shop.

Rinsing . . .

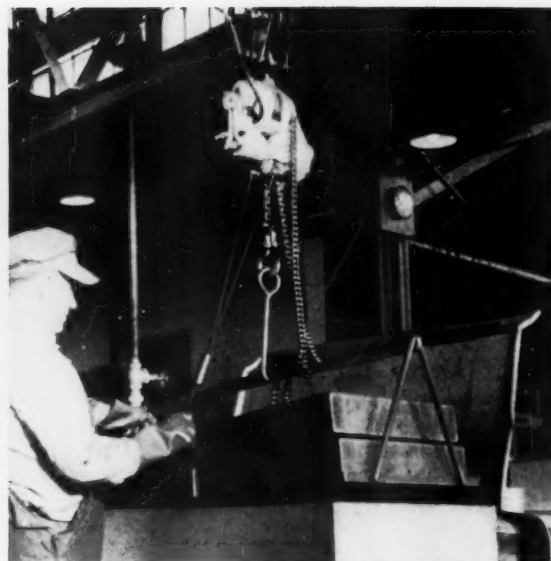


Second step is a rinsing vat where the cleaning solution is flushed from the filters and they are then blown fairly dry with compressed air.

Drying . . .



Portable heater has been permanently connected to drier to supply a large volume of heated air. At every stage in process handling is done by hoist running on the overhead tramrail.



Oiling . . .



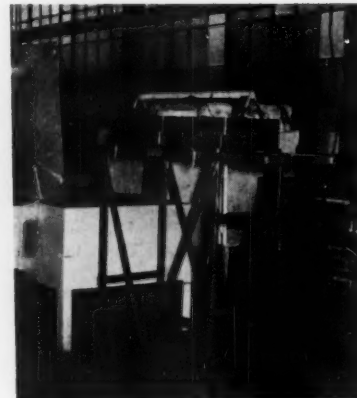
Oiling is done in a tank with a slotted top which permits filters to be hoisted in and out without having an open oil vat in the shop area.

Draining . . .



Last stage is drying cabinet where excess oil drains from filters the oil remaining in them "sets up" to ready them for the locomotive.

Transporting . . .



Rack holds carrier and set of filters for trip to the locomotive. Rack height is adjustable for handling in shop and at the side of the locomotive during filter change.

Automobile Transporter

(Continued from Page 46)

the folding type so they could be opened between coupled cars. It is intended to load and unload these cars "circus" style and bridge plates will be used to connect the decks at each level so that automobiles can be driven through a coupled string of these transporters. The end door latching arrangement is similar to that used on refrigerator car doors but much heavier.

Automobiles are usually shipped without the hub caps installed nowadays. This simplified the anchoring

arrangement devised by the CNR. The "hub attachment" is arranged to be attached to three of the five automobile wheel studs. It has elongated holes which accommodate the varying bolt circles used by different manufacturers. On to this is slipped an anchoring ring which is retained with a large nut. From the ring run two chains which are pinned to the sliding floor side angles through clevises. The automobile is then retained at each wheel, and the anchoring arrangement can be applied and removed rapidly.

The finished car weighs over 70,000 lb and has a load limit of 110,-

000 lb. It has Miner A-22-XL draft gears. Its 50-ton, spring-plankless trucks were supplied by Standard Car Truck which also supplied the stabilizers. The car has Westinghouse air brake equipment with a single 10 x 12-in. cylinder, and a Universal "pump handle" type hand brake applied at a recess in the side sheathing at one end. The transporter is fitted with permanent lighting fixtures on each deck, trainline receptacles and connectors, and standby receptacle and cable. This 110-v system is intended to be used during loading and unloading operations.

Supercharging of Two-Cycle Diesels

These units, designed for supercharging, point the way to lower fuel consumption, increased output, and a greater reduction in size per horsepower.

The successful turbocharging of two-cycle diesel engines has been a desirable goal for many years. A satisfactory solution was not forthcoming until suitable turbochargers had been developed with pressure ratios from 2:1 to 3:1. Rapid progress has been made recently with results which more than justify the development efforts expended.

This article is an abstract of three papers contributed by the Oil Gas Power Division of the American Society of Mechanical Engineers and presented at the recent annual meeting in New York. While the data presented here is related

mostly to engines used for other service than railroad locomotives the results point the way to future possibilities in railroad motive power prime movers.

The information on the General Motors engines was taken from a paper by P. J. Louzecky of the Cleveland Diesel Engine Div. General Motors Corp. (ASME paper No. 56-A-100); the Fairbanks, Morse data from a paper by A. K. Antonsen, chief research engineer of that company (ASME Paper No. 56-A-99) and the Napier-Deltic data from E. Chatterton's paper (ASME No. 56-A-141). Mr. Chatterton is chief engineer, D. Napier & Son, Ltd. London.

Engines with small dimensioned multiple cylinders running at high speed can be designed and made lighter and smaller for a given output than those having less cylinders running at a lower speed. This fact has created the desirability for a "high speed diesel". The demand for more horsepower, at the same time limited by a maximum axle load is attracting more attention to this form of locomotive power.

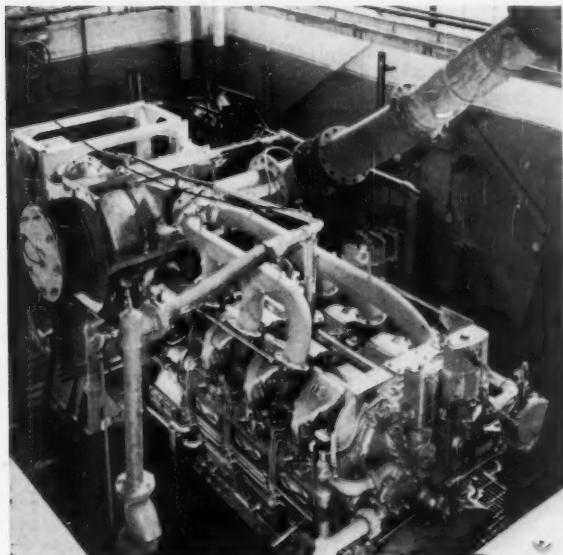
From an economic standpoint,

lightweight engines enjoy lower maintenance costs. Readily lending themselves to part interchangeability, they rule out expensive servicing methods or equipment. Engine changes are accepted as a matter of hours, not days. These facts alone may have justified the continued research and development of this engine.

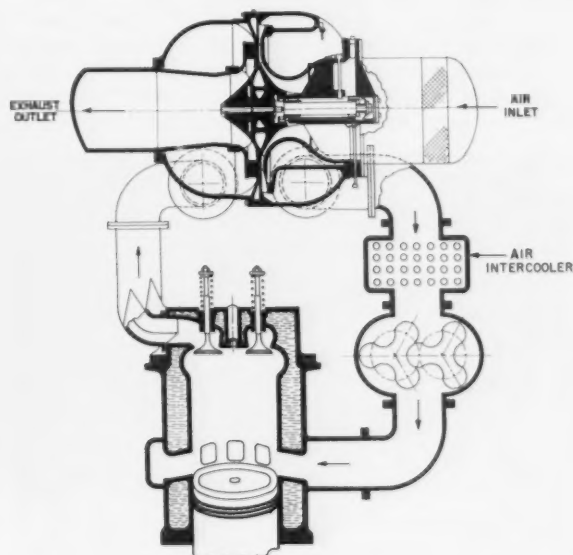
Successful results have been necessarily slow in materializing. It was not until suitable superchargers

with 2:1 to 3:1 pressure ratios became available that a practical solution was reached. General Motors, Fairbanks-Morse, and Napier of England have proposed three different solutions to this question of supercharged, two-cycle diesel. Proper matching of charger to engine out of the way, these builders turned their efforts to overcoming the starting and acceleration problems of such an arrangement.

Cleveland Diesel's bid for this type of power is based on a V-type, 6-8-12 or 16 cylinder, two-cycle diesel engine coupled to, in this case, a DeLaval turbocharger. Air, compressed by the exhaust gas energy in this turbocharger is forced through an intercooler maze before entering the standard, positive displacement engine-driven blower. Precooling this air packs more oxygen into the cylinders and greatly reduces thermal problems in the positive-displacement blower. This blower supplies the required air to start the engine and assures a posi-



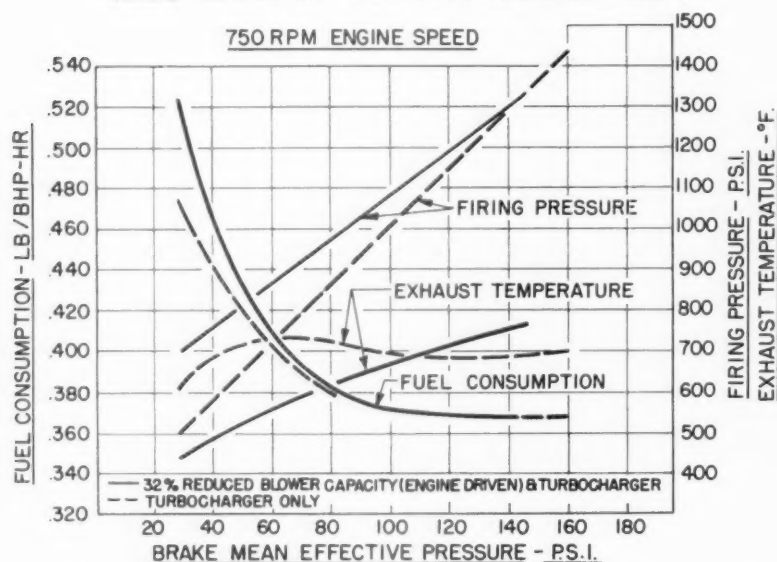
General Motors' Model 6-278BS two-cycle turbocharged diesel engine in a test stand setup.



A diagram of the two-cycle turbocharging arrangement selected for the General Motors design.

MODEL 6-278 BS PERFORMANCE CURVES

8 3/4 X 10 1/2 6 CYLINDER 2 CYCLE TURBOCHARGED DIESEL



tive amount of air until such time as the turbocharger reaches its true efficiency. It is in this same engine-driven blower that the second stage of compression takes place.

As seen in the picture, a branch type manifold recovers the pulse energy in the exhaust from each cylinder. These two manifolds are joined at a pulse converter, converting the kinetic energy in the pulsations to pressure energy. This is effected by controlling the expansion through a diffuser. Having been slowed down in the converter, the gases pass through the turbine to the atmosphere.

The turbine-driven centrifugal compressor pulls new air through an inlet filter and silencer directing it into the intercooler and then to the

driven blower as previously mentioned. Completing the cycle, the engine-driven blower forces this denser air to the engine air box and then to the engine cylinder.

Obviously, when operating at a greater output, a much larger volume of air is needed by any supercharged engine. The density of the air scavenging the cylinder is almost twice that of standard types. The rate of load application to a supercharged two-cycle engine remains a problem, the difficulty lying in the inertia lag of the exhaust-driven supercharger.

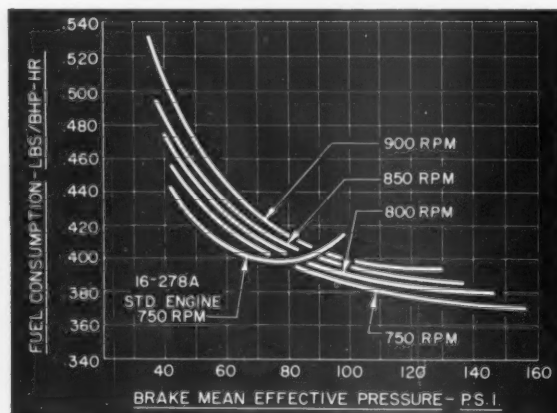
The turbocharger-engine arrangement proposed by General Motors has been designated as the Model 498, and embodies these design features. The crankcase is very rigid

to withstand the increased in-charging and firing pressures. The entire unit is four-corner mounted. The rear two are doweled to the base and bolted. The two front corners have enough tolerance of movement to minimize any thermal stress or distortion.

To reduce bearing pressures and to control torsional vibrations, the crankshaft is greater in diameter than its predecessor's. The design called for floating type pistons again to reduce thermal distortion and increase their resistance to wear. Strap constructed connecting rods permit the use of larger crankpin bearings. In spite of the bearing size, the connecting rods and pistons may still be removed through the cylinder liner. As for the exhaust system, all passages were streamlined as much as possible and proportioned to regulate the gas flow from the cylinder to the manifold. This serves to restrict the acceleration and deceleration of the exhausting gas.

Performance:

It is believed by those responsible at Cleveland Diesel, that this represents a practical answer to supercharging a two-cycle diesel engine. As reported, turbocharging has increased engine output almost 100 per cent over standard engine figures. It was equally encouraging to find that the firing pressure in the cylinders only increased from about 1,100 to 1,350 psi in the turbocharged model. Fuel consumption figures indicated that they are almost proportional to the increase in



Model 16-498 Fuel Consumption Curves 8-3/4 x 10-1/2 16 Cylinder, Two-cycle Turbocharged Diesel.

ENGINE MODEL	NO.	NONTURBOCHARGED DIESEL ENGINE		TURBOCHARGED DIESEL ENGINE	
		16-278A	16-498	16-278A	16-498
ENGINE SPEED	RPM	750	750	750	750
ENGINE LOAD	BHP	1600	2800	1600	2800
B.M.E.P.	PSI	83.6	146	83.6	146
FUEL CONSUMPTION	LB/BHP-HR	400	374	400	374
EXHAUST TEMPERATURE	°F	615	740	615	740
FIRING PRESSURE	PSI	1050	1335	1050	1335
COMPRESSION PRESSURE	PSI	600	730	600	730
COMPRESSION RATIO		15.6	13.2	15.6	13.2
AIR PRESSURE					
COMPRESSOR DISCHARGE	PSI	—	15.0	—	15.0
AIR BOX PRESSURE	PSI	3.7	14.5	3.7	14.5
AIR BOX TEMPERATURE	°F	150	120	150	120
EXHAUST PRESSURE					
TO TURBINE	PSI	—	11.5	—	11.5
TO STACK	PSI	1.5	.25	1.5	.25
AIR FLOW - FREE AIR	CFM	5730	9800	5730	9800
AIR FUEL RATIO (BASED ON TOTAL AIR)		38/1	40/1	38/1	40/1
TEST HOURS	HRS				

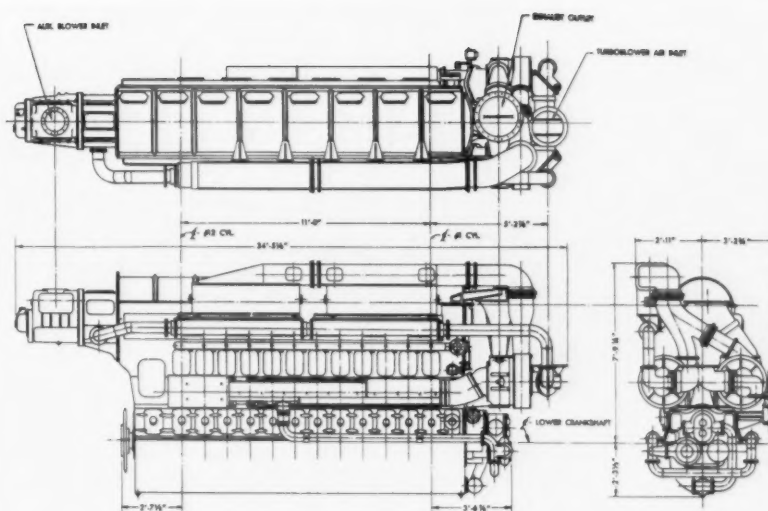
Performance Comparison.

friction power. There is said to be little change in exhaust temperature with an increase in engine speed.

Fairbanks, Morse & Company

In 1952, with the availability of a highly efficient turbocharger, it became apparent to this company that a production supercharged, two-cycle diesel engine was in order. This unit was developed with two things in mind; to increase the engine rating and substantially reduce fuel consumption. As others had come to realize, the pulse system resulted in the most efficient engine and turbocharger combination.

With over eighteen years experience in producing opposed piston, two-cycle engines for locomotives behind them, this company thought it best to develop the supercharged versions from this basic design. The simplest application of supercharging was selected for the early tests. The engine remained un-

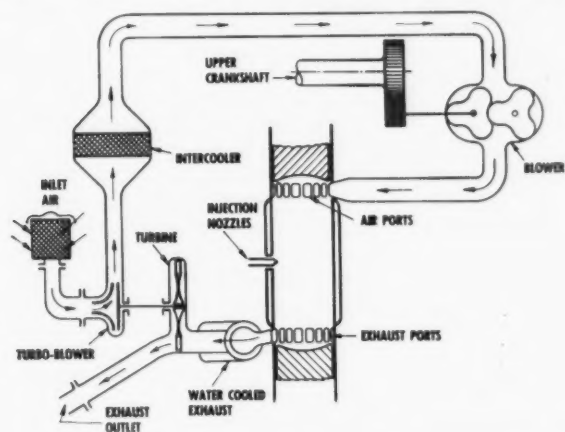


General arrangement drawing of the Fairbanks-Morse supercharged, 12 cylinder, opposed piston diesel.

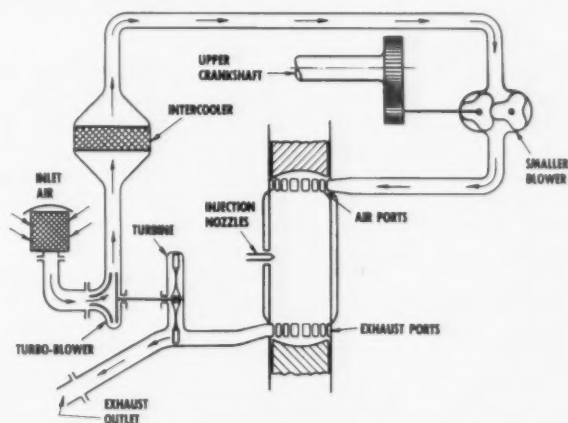
changed except for minor modifications to accept the turbocharger which delivered the scavenging air to the existing engine-driven blower.

The built-in exhaust manifolds remained water-cooled.

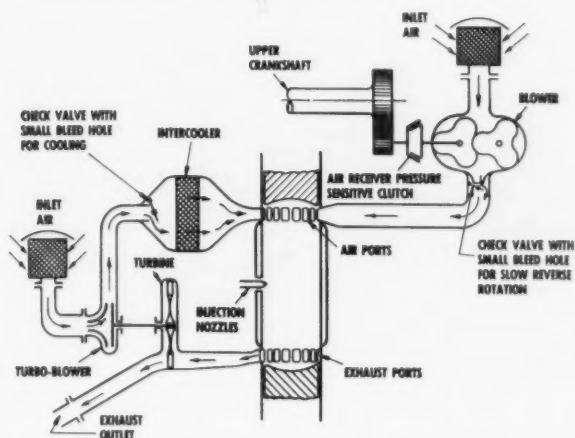
The results of the initial tests were gratifying inasmuch as the



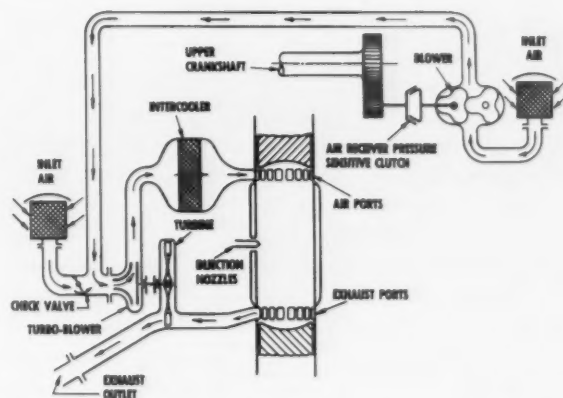
A diagram of an early supercharging experiment.



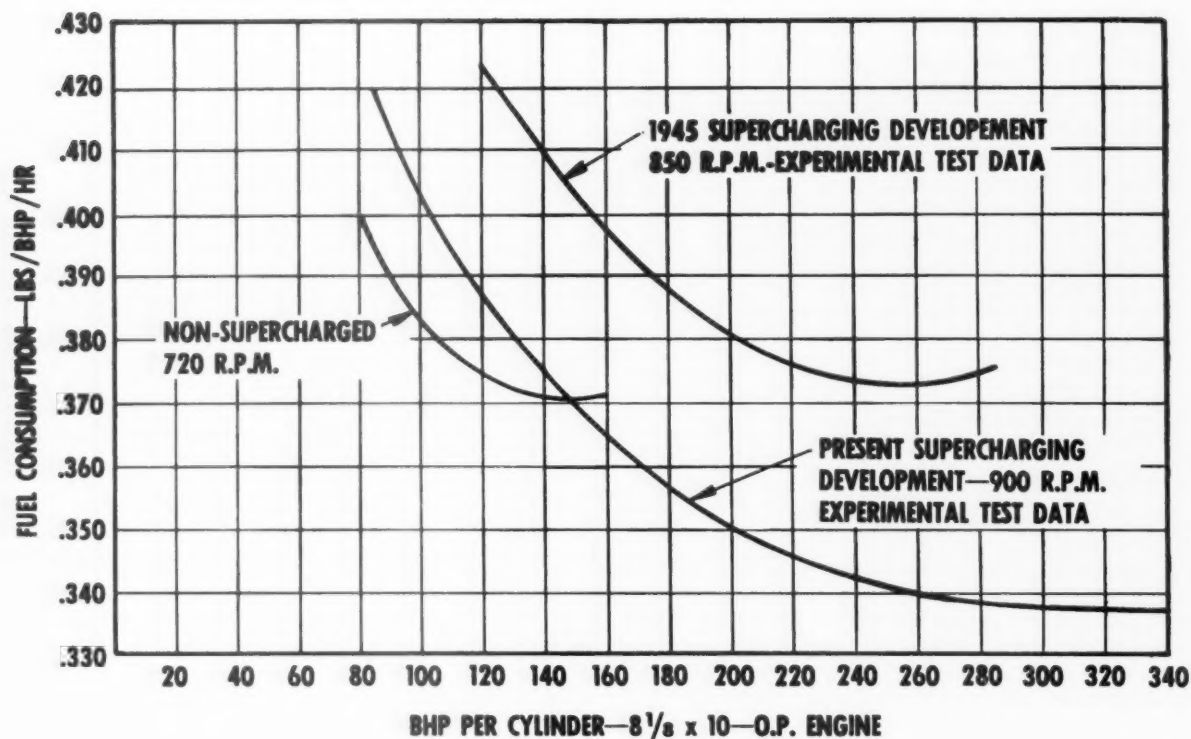
An improved series blower arrangement with a calibrated positive blower and a non-cooled exhaust manifold.



An auxiliary positive blower setup for light load operations.



The present auxiliary positive blower arrangement. Discharge is into the turbo-blower inlet.



overall turbocharger efficiency reached about 49% and the firing pressures remained under 1,500 psi. On the other hand, it was interesting to note that a full load produced a darker exhaust and an excessive amount of wear was experienced on piston rings, cylinder liners, and piston pin bushings. These findings were brightened by the improvement in fuel consumption which indicated even greater promise in further development.

Experimentation to date has covered four different stages of supercharger designs. Beginning with an arrangement of water-cooled exhaust manifolds common to all

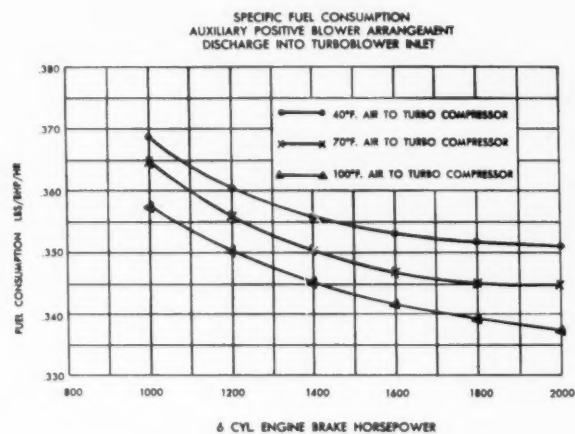
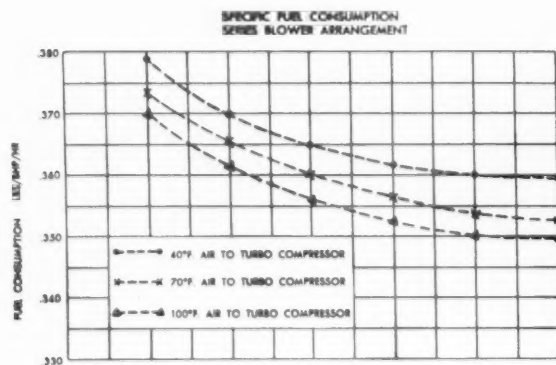
cylinders tied into the existing engine-driven blower in series with a turbocharger, the next design was identical except that a non cooled, pulse-type exhaust manifold was introduced. It was possible with this plan to have the engine-driven blower do very little or no work at three-quarter to full load.

The next and third stage was a refinement of second. The blower was purposely made small and was called upon only during starting and light load conditions. With this system a critical point of pulsation was observed which appeared the moment the turbocharger overcame the blower pressure. It also estab-

lished that intercooling was necessary to the air entering the blower.

The fourth design differs from the third only in the method of air delivery. Instead of going directly to the air receiver, the auxiliary air supply is delivered to the turbo intake. In this manner the auxiliary blower air aids in starting the turbocharger and in addition must pass through an intercooler.

Nearly three years of experimentation has produced a supercharged, opposed piston, two-cycle diesel engine that is self sustaining over the entire load range, including starting. Production-wise, general arrangement of turbochargers has been



worked out with resulting simplicity. Six, eight, ten and twelve inch diameter cylinders will use basically the same turbo charger. The six and eight inch sizes will use a single unit and the ten and twelve inchers will carry two units.

Fairbanks-Morse management express the belief that the supercharging of two-cycle, opposed piston engines can be achieved with production simplicity and operational dependability equal to or exceeding the four-cycle engine. Performance figures on this latest model bear out their optimism in predicting inherently greater fuel economy. (Test results indicated a 0.333 lb/hphr possibility for this medium speed engine.) It is further reported that there is no serious performance sacrifice to gain the increased engine output; as previously mentioned, sudden load variations between one-half and full load are handled without the aid of auxiliary blower equipment as well as starting and minor sudden load changes.

The reader is referred to the photograph of the Napier's "Deltic" engine. This is offered as an interesting solution to the question of supercharging the two-cycle engine.

Briefly, two of these Deltic engines are combined with an electric transmission resulting in a 3,400 hp locomotive having an axle load under 19 tons. Total weight of this English Electric Company locomotive is about 240,000 lb, or 71 lb/hp. This is believed by the builders to be the lightest weight ever attained.

The Napier Deltic engine, which features opposed-piston cylinders arranged in the form of a triangle, was selected because of the belief that this design overcomes most of the technical objections to the opposed-piston layout. Furthermore, the space between the cylinders provides room for an axial-flow compressor. The resulting assembly is a compact engine reported to weigh only about 2½ lb/Bhp for an output of 5,500 bhp. The accompanying photograph clearly illustrates this principle.

The decision to adapt this type of opposed piston, supercharged engine to this particular railroad application was based on these conclusions:

(1) In spite of its economy in the use of air, the four-cycle engine cannot compete on a Bhp

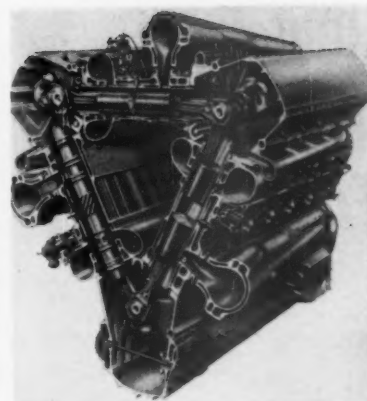
basis per cubic inch of cylinder with the two-cycle engine.

(2) Because of its small piston diameter in relation to the cylinder volume, the opposed-piston cylinder is capable of producing a far greater output at a given piston temperature than other types.

(3) High degrees of supercharging exert considerable influence on the final power output. For these high manifold pressures, an axial-flow supercharger is regarded essential.

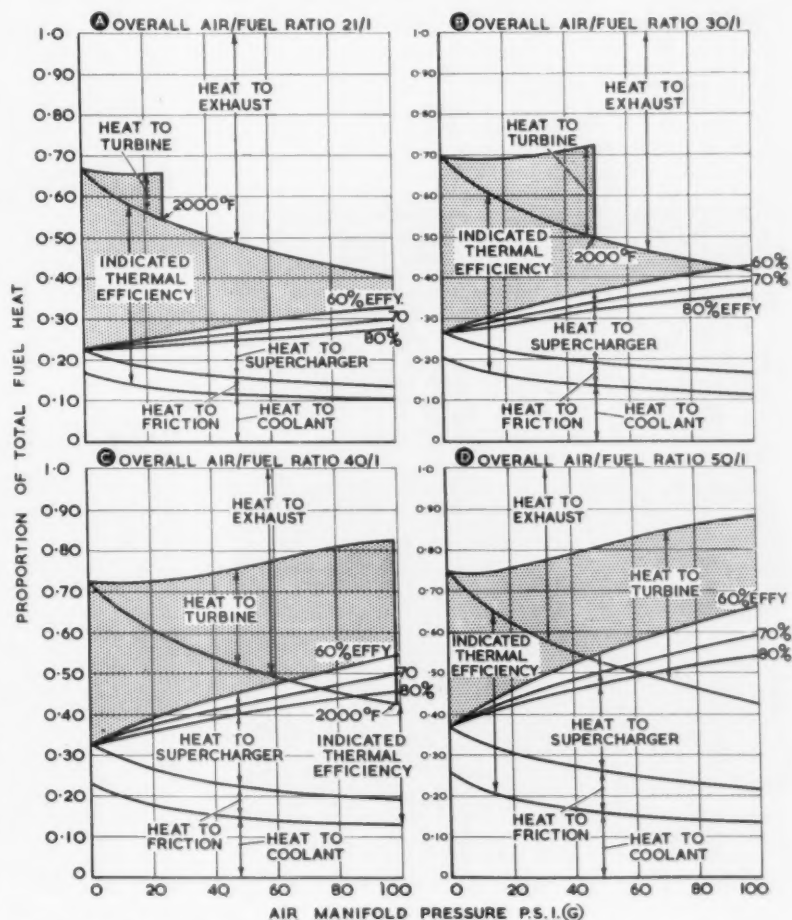
(4) Since the turbine furnishes more power than can be absorbed by the supercharger, it must be geared back into the engine output, forming a "compound" engine. The increased power resulting from increased supercharging and air/fuel ratio can be obtained with very little sacrifice in fuel consumption.

To sum up the facts presented, with some supercharged, two-cycle



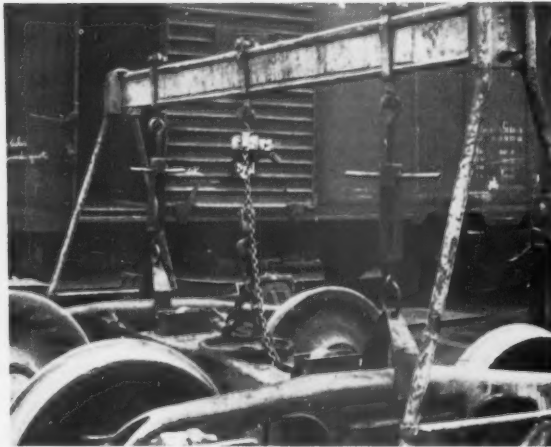
The Napier "Deltic" engine, which employs opposed pistons in a triangular arrangement. This design is said to lend itself readily to the axial flow compressor described.

diesel engines already in production and others about ready for release, it is reasonable that this form of motive power be given serious study. All of the effort and success warrants this consideration.

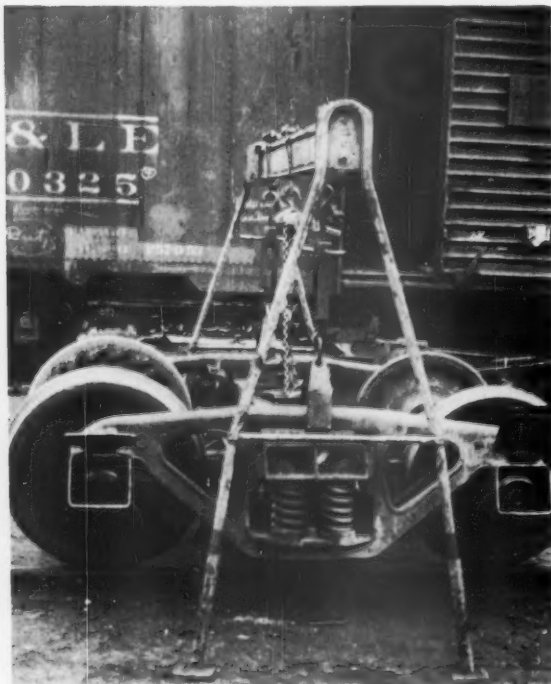


Heat Balance diagrams for the Napier engine.

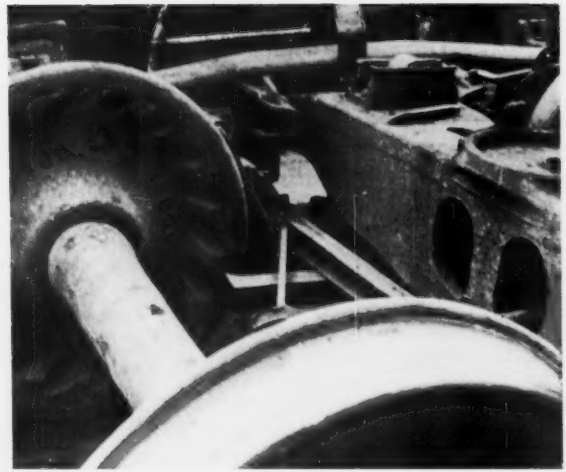
How P&LE Tears Down Freight-Car Trucks



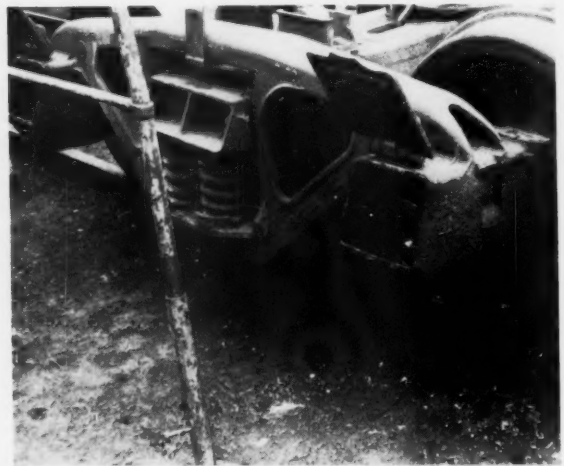
1. The Pittsburgh & Lake Erie has constructed several of these lightweight frames to simplify the disassembly of freight-car trucks. The hoists, mounted on rollers so they can be easily moved along the top rail, permit individual lifting of the bolster or either side frame.



2. The frame can be moved easily to any car undergoing repairs.



3. The first step in truck disassembly is freeing the brake beam hangers.



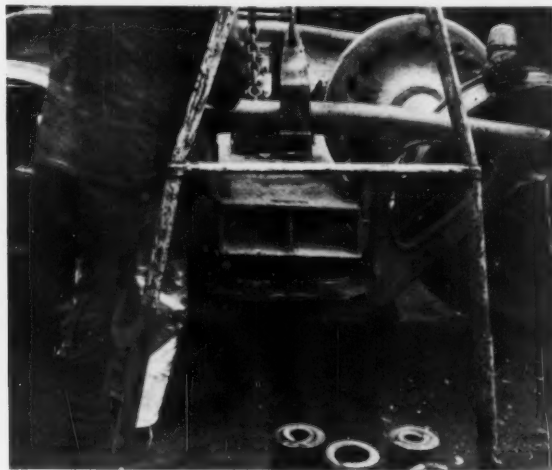
4. Turnbuckle raises the side frame to allow removal of bearings and wedges.



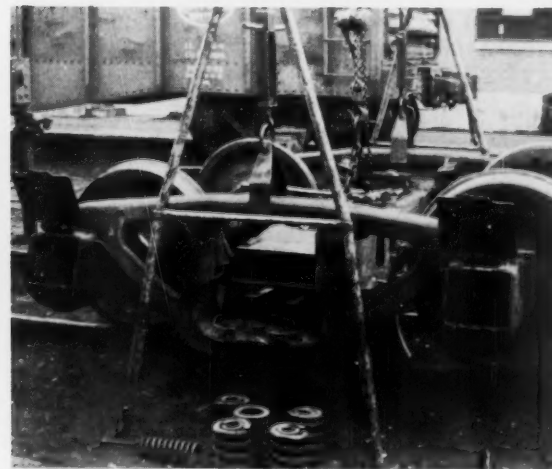
5. Central ratchet hoist then raises the bolster to unload the springs.



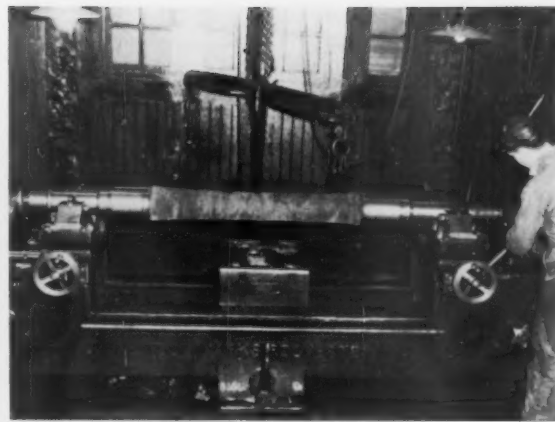
6. Springs are removed so that the bolster can be lowered out of columns.



7. The bolster is then lowered out of column guides to free the side frame.



8. The side frame is rolled away from the bolster and the disassembly is complete.



Converted burnishing machine.

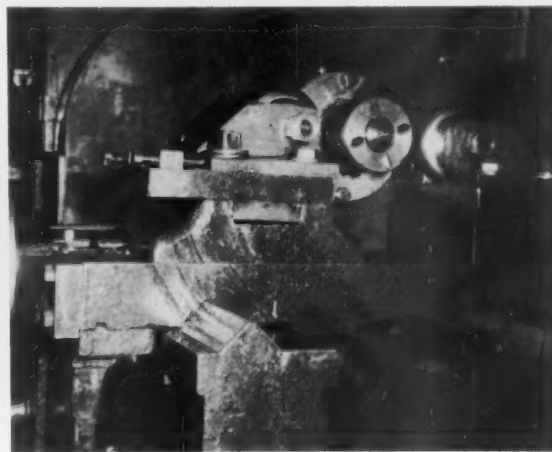
Burnishing Machine Has Spring Loaded Friction Drive

A high-speed burnisher turning out 24 axles per 8-hr shift made from a center-drive axle lathe. The converted burnishing machine is belt driven throughout except for the feed shaft, which is gear-driven.

Burnishing is done at 215 rpm with a feed of .020 in. per revolution. The rollers are stellite and the driving motor is 15 hp.

The axle is quickly loaded and positioned for burnishing through a spring-loaded live center and friction drive. The housing for this threads in and out to adjust for minor differences in axle lengths. The four drive jaws are made of tool steel shaped to a moderately sharp edge for gripping the axle to revolve it.

A jack is to be applied to the block in the center of the machine to reduce loading time to a minimum by lining up the axle to the two centers without hand guidance.



The spring loaded line center and friction drive.



Hydraulically operated boom on this vehicle swings a full 360 deg, making it easier to unload truck frames, wheels and flooring from gondolas.

Simplifying Handling and Storage of Heavy Car Parts



The crane also permits storing heavy parts and large jigs on blocks or pallets instead of on concreted areas or on flat cars as had to be done with previous unloading methods.

A novel type vehicle with an integral crane, originally developed during the war for torpedo loading, has been found quite handy at an industrial plant for a number of operations similar to those performed regularly at railroad car repair points.

The vehicle used is an Austin-Western 5-ton hydraulic crane. The boom can swing in a full circle, and both front and rear wheels steer for maximum maneuverability. Controls are such that the boom can be raised, extended and swung at the same time. For loads up to about 3 tons at full extension of the boom, or full 5-ton loads at partial extension, the wheels are mounted one way on the axle. This gives minimum distance between them. For full loads at full extension of the boom, the wheels are reversed on the axle to increase the transverse wheel base 8 in.

The car is used mainly as a yard crane. It can tow or push. Maximum speed is 20 to 25 mph.

In addition to making the loading operations easier by its ability to reach into a storage shed or the end of an end-loading box car, the crane also permits the use of simpler storage facilities. Where concrete platforms or flat cars were formerly needed for storing heavy parts, now all that is needed is to throw down some cinders and ties and store the parts on the ties. This has also eliminated the problem of cracked concrete from the heavy loads.

**The First in a New Service Series
To Run Every Other Month**

Roll Them Out Like New

"Roll Them Out Like New" is the title being given to a series of articles on diesel electric locomotive shop practice which begins in this issue. Like the "Keep 'Em Rolling" series, which was so popular, the subject will be presented in "words of one syllable".

The new series will have to do with the "hospitalization" type of treatment rather than "doctor's office call" type described in "Keep 'Em Rolling." It will follow through backshop procedure, detailing the work required and describing methods of work and testing which are most effective. It will explain why the various jobs are done.

Also, the series will have direct bearing upon the relative desirability of railroad versus manufacturer's shop repairing and with the questions of rebuilding, remanufacture and the economic life of a locomotive.

- ▶ **The articles will run every second month.**
- ▶ **Be sure you do not miss any.**
- ▶ **They will be worth saving.**

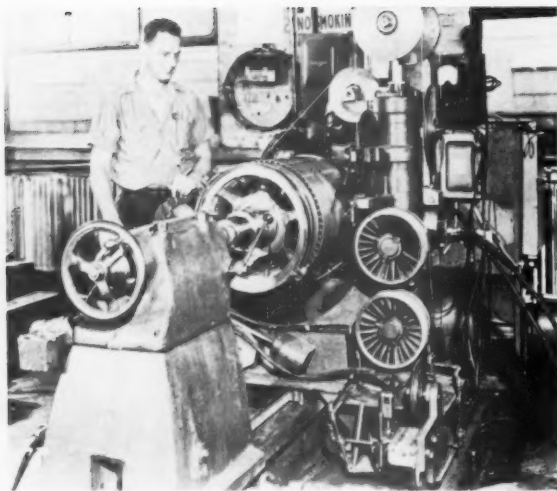


By J. W. Teker, Locomotive & Car Equipment Dept., General Electric Co., Erie, Pa.

There Are Two Kinds Of Maintenance

There are two kinds of maintenance. Sooner or later stress and wear take their toll. This is true for every kind of machine man makes—even for the wonderful mechanism of the human body. Unlike the body, however, machinery does not repair itself. Man must correct the wear and tear on the machines he builds.

Locomotives are no exception to this rule. Fuel and air must be supplied to the engines. Parts must be cooled and lubricated. Dust and dirt must be cleared away, and adjustments must be made to take up wear. This is the kind of service that is needed to keep locomotives rolling. It is running maintenance—like giving your



Repair of electric equipment often requires special machines and tools.



Exacting measurements are part of a fully equipped repair shop.

body the food, air and everyday needs to keep in good shape. Running maintenance includes periodic checks to insure that the equipment is in good operating condition. These are like regular physical check-ups on the state of your health.

For every machine the time comes when a different kind of maintenance is required. All the adjustable wear may be used up; parts may have been weakened to the breaking point; or an accident may have smashed the machine. This is where the repair shop comes in. The locomotive goes to the railroad shop or the manufacturer for overhaul. This is like going to the hospital for surgery to put your body back into first class shape.

There's a Difference

Running maintenance and overhaul are both vital to locomotive operation. Both have the same purpose—keeping locomotives on the job. Yet they are very different. Running maintenance aims at having motive power ready to go when needed and keeping it rolling. To do this, troubles are quickly located and corrected on the spot. If necessary, defective equipment is replaced so the locomotive can go when called. Except for this and making adjustments for wear, there just isn't time or place for elaborate repairs. Fuel, water, oil and sand are put aboard. The locomotive is washed and the interior mopped up. Necessary inspection forms are signed and the locomotive is hustled out for another run.

The work of the repair shop is very different. Here it is not a question of a quick turn around to make another trip. The job now is to put the equipment into shape to make hundreds of trips. Weakened and worn parts are rebuilt to restore the margin needed for running adjustments. Inspection and test decide whether parts are fit to operate for another long period without failing. To do this, heavy and complex equipment must be torn down to reach the innermost parts. Such work requires time, special tools and various skills. Exacting measurements must be made and special operations performed. At times even laboratory techniques are used.

The whole attitude of the repair shop is more deliberate. Actions taken here have far reaching effects. Results are not judged by a single trip; but by one, two, or even three years of trips. This kind of work would be entirely out of place in a running maintenance organization. In fact, it would only interfere with the fast, efficient, smooth operation of such a group. Therefore, it is profitable to keep these two kinds of maintenance separate. The overhaul shop should be completely removed from running maintenance facilities. As a general rule, even the same men should not work at both types of jobs. The two take different paces, skills and temperments. A good running maintenance man is familiar with the over-all operation of a locomotive. He knows how one piece of equipment is related to another. He is not so much concerned with details of the inside parts and devices as is the shop man. A good shop man is more likely to be a specialist. He builds up his skill to meet the demands of one exacting job and confines his attention to that.

Another thing—it is hard to find a man that is expert at all jobs. Imagine a man who can sledge up a steam engine piston rod to a crosshead, then climb into a diesel cab and adjust a governor or transmission relay, and finally walk over to a bench and finish winding an armature! This doesn't mean it can't be done—but is it good practice? Bringing too many kinds of jobs under one roof is bound to result in confusion and conflict. To a running maintenance man, the rhythmic throb of a diesel engine is sweet music. To a shop man, it just represents so much noise, smoke and dirt that he doesn't want around when he is making a precise measurement or closing a freshly lubricated bearing.

We Need Both

Both kinds of maintenance are needed in railroad operation. Each is important in its rightful place. How well each job is done has a big influence on how long a locomotive stays in service.

Every railroad, even though it may own only one locomotive, must provide for running maintenance. But,



Railroads with a small volume of shop work may wish to take advantage of the service offered by manufacturer's service shops.

must it also have a repair shop? That question is not always easy to answer. Only careful investigation and serious study will show whether it is a costly luxury or a profitable investment.

One thing is certain, sooner or later every locomotive needs the services of a repair shop. It gets worn and needs to have its youth renewed. But such a shop is not a fountain of youth bubbling up free for the asking. It represents a sizeable investment in facilities and personnel. It is an exacting taskmaster, demanding the best of industrial know-how and management to make it pay. It requires constant effort to keep up with the latest methods and processes in order to stay on top of the job. It must strike the economic balance between cost of repairs and cost of road failures. Mistakes one way or the other can foul things up badly. They can make the difference between a shop that efficiently meets the need, and one that is a white elephant with enough troubles to eat the railroad out of business.

Regardless of how large or small a railroad may be, some kind of shop must be considered. How large and how well equipped should it be? How much work should be attempted, and how far should it be carried? When should the locomotive builders shop be used?

To answer these questions, let's go back to our first comparison. A shop is like a hospital. Every community, no matter how small, needs a hospital. Yet many cannot afford to have a completely staffed and equipped hospital—they just don't need it often enough. They must send their serious cases to a larger community that is able to support that kind of hospital. In the same way, volume of work is a very important factor in deciding the kind of a repair shop. It takes a good lot of business to justify the large investment and skilled payroll of a fully equipped shop. This is not throwing cold water on the idea of a shop. It is simply viewing the question in a way that makes good sense. So, look before you leap. It is expensive to turn back once an ill-advised investment is made in a shop. Discuss your problem with others who have had experience. Try to find out what the break-even point is for your operation. Val-

uable information on this subject is contained in the reports of AAR Committee Section 12 on Repair Shops, Electrical Section of the Engineering and Mechanical Divisions. This Committee has prepared a comprehensive outline of the items that should be considered before embarking on a shop modernization or capital improvement program. This is so complex as to almost require individual study for each particular shop.

How Little or How Much?

Let's see how the principles just stated might fit into any situation. Overhauling and rebuilding of the variety of machinery which makes up the diesel-electric locomotive requires special tools and men having many different skills. These men can do the best job when they have the best equipment, just as the skilled surgeon can operate best in a fully equipped hospital.

Some of the skills and tools have been passed on from the days of the steam locomotive. With proper changes they can be adapted to the new job. A good example is locomotive trucks, wheels and axles. The air brake system is another case. Steam and air piping, couplers and draft gear, and signal systems are some more that are already familiar to any railroad shop.

The diesel engine, radiator cooling system and air brake compressor are new. Although they make more exacting demands on the machinists' skill, they are still mechanical in nature. You can see what is needed and visualize how the parts work together. New standards of precise work, accurate measurement and cleanliness are required. For some mechanics this may mean self-discipline and self-development. The man whose heart is in the work will take it, once he knows what the job demands and the opportunities it holds.

The newest and least familiar addition to the shop program is the electric equipment. There is the control apparatus, the maze of wires and cables, and the motors and generators. A host of special tools, machinery and testing equipment has evolved from this type of motive power. The little corner of the old steam shop allotted to the electrician would be more than swamped today.

This special equipment is no problem in itself—all you need is enough money to buy what you require and shop space to install it. But to find men qualified to use this equipment effectively is a matter which is becoming more serious. In addition to the usual machinist skills, the electrical shop needs a blend of mechanical and electrical skills. These men must understand things that cannot be seen, such as the flow of electricity and the effect of magnetic fields. They must know how iron, copper and insulation work together in an electric machine. They must understand the needs of bearings and the balancing of rotating parts. They must be aware of the proper use of snug and shrink fits in combining these materials. They should know processes involving special-purpose equipment, such as soldering, brazing, binding, varnish treatment and seasoning of mica.

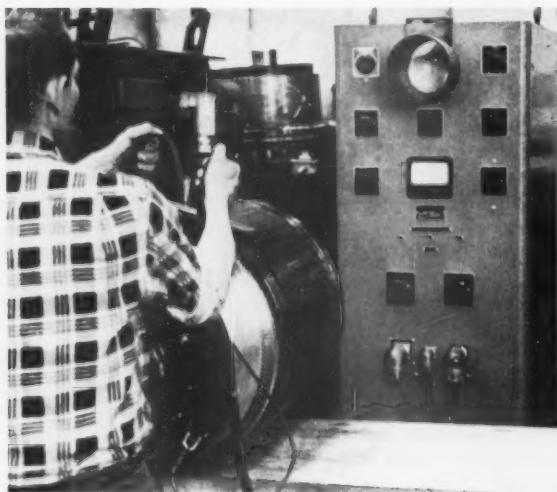
Shop work not only involves the sciences, but also draws upon the arts. Many operations are routine and predictable. Examples of this are measuring hardness of commutator segments, obtaining bar-to-bar resistance of armature windings, and determining the viscosity of varnish. Other operations depend upon skill, feel and judgment acquired only by training and experience. One instance is the placing of coils in armature slots without damage; another is feeling the roughness of a spinning commutator and knowing what to do to improve it. You just cannot take men off the street for such jobs. They must stay with the work long enough to acquire such abilities. They are the surgeons of the motive power department. Like any good surgeon, their skill must be developed by study and practice. Also, they must keep posted on new processes and improvements so that the equipment they overhaul will be a credit to them and to the shop. Jobs like this are a challenge to the highest type of workmen—men who take pride in their achievements.

The overhaul of electric equipment is not a screw-driver-and-monkey-wrench job. It requires proper tools and equipment, and a high degree of know-how and skill. Unqualified men and poorly equipped shops should never attempt it. Harm can be done faster than

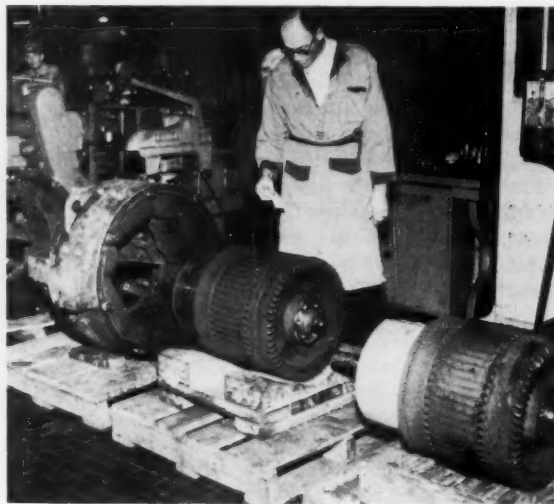
it can be corrected. Little things that seem unimportant can make an awful lot of trouble. Defects painted over to give good appearance; insulation contaminated by improper cleaning; or bearings assembled incorrectly can prove very deadly. The resulting road failures and train delays are a big price to pay for such work. Certainly it would have been much wiser to have the job done by trained personnel. As a matter of fact, the most economical plan in many such situations is to take advantage of the manufacturer's repair shop service. This insures the use of factory parts, expert workmanship, and a top quality product. Also, it saves the user carrying the burden of shop investment and operation. Small railroads that do not have enough overhaul business to justify a fully equipped shop and a staff of trained men, will find this solution of their problem almost ideal.

A different situation arises where there is considerable overhaul work. While this justifies a shop, it may prove economical to draw the line at some labor skill or amount of investment. Difficulty in obtaining and training men in certain skills, or the amount of investment required for equipment and facilities may set the limit. In such cases all the mechanical work will most likely be done by the railroad. This includes work on the running gear, air brakes and steam system. Existing steam facilities can be changed over at a reasonable cost to take care of this work. The mechanic skills may also fit into this plan with a moderate amount of training. The addition of a shop for major overhaul of engines, motors and generators is another matter. This may be too much for the budget to stand. The cost of specialized tools and machinery for this work is high. Skilled workmen are probably not available, and a training program involves more money and time. A good solution is to send this major rebuild work to a dependable, qualified service shop, or to the original manufacturer.

The next step toward a complete shop is the railroad doing all the electrical cleaning and overhaul work. Only complete rewinds, rebuilds and wrecks are sent to the manufacturer. This may work some economy.



Shop man must understand invisible things, such as flow of electricity.



Proper storage and care of electrical parts is of prime importance.

However, it involves the responsibility of deciding which equipment to clean and which to send out for repair. Someone must be competent to judge the condition of equipment when it is received. For example, he must check the tightness of the armature bands and wedges, the condition of the commutator, and the insulation. This course involves an outlay for handling, cleaning and specialized testing equipment. Also, qualified men must be recruited or trained to do the work.

The final step is for the railroad to have a fully equipped shop and all that goes with it. Even then it may be desirable to draw the line at a work load that will permit maximum operating efficiency. Any work above this limit is sent to the manufacturer's shop. Every shop experiences wide swings in the work load. These may be the result of seasonal changes, unexpected emergencies, wrecks, floods, etc. By farming out the extra work, the railroad shop force can be held at the usual level and assured steady work. This is a big help in keeping good men on the job. Also, the investment in tools, machinery and facilities can be fixed at a reasonable level. Otherwise it would have to be high enough to take care of the emergency peaks. The builder's shop can be used like a flywheel to steady the ups and downs of the railroad shop load. This scheme often results in a smoother, more economical operation. Here is a potential benefit that justifies careful study by alert shop management.

Write It Down

Regardless of how much or little shop work you do, good records are important. We all like to know what we are doing, and a well-run railroad shop is no exception. That is where a good record system comes into the picture. It enables you to keep track of what was done and what the results were. This is specially important in shops where a large number of motors, generators and auxiliaries must be overhauled or rebuilt. It is particularly important when you want to get information on results from using new materials or

processes. Don't trust your memory. You may be able to recall what was done a week or even a month ago. But most equipment doesn't return to the shop for a year or more. By then it will be impossible to recall what was done and to which equipment. Then the "little black book" that a careful workman keeps in his pocket comes in mighty handy. But you can't depend on the chance that some workman made a record of what you may want to know a year or two later. The only safe thing is to have a system for keeping such information. Remember, the shop is the locomotive hospital, and a hospital is careful about checking all patients in and out. Their record of your condition and course of treatment may mean your life. In the same way accurate shop records can be helpful in obtaining long equipment life.

Records prove invaluable in the analysis of troubles and the study of costs. They are also a means for improving operation. As an example, take the screening and inspection of incoming jobs. If repeated entries are found which show evidence of abuses and bad practices in running maintenance, corrective action can be taken. Repeated signs of overheating may point to defective blowers, or broken or blocked air connections. The trail may even lead to defective relays failing to make backward transition when pulling up heavy grades. Another case might be persistent records of powdered mica under the bands and armature coils. This could result from faulty tension calibration on a binding lathe. It might also be caused by defective gearing. This, in turn, might be traced to bad gear case lubrication during running maintenance. Finding and correcting such troubles pays off in longer equipment life and fewer road delays.

Good Housekeeping

In addition to records, good planning and organization are vital to an efficient operation. They smooth the flow of work through the shop. The difference between a good and bad shop layout quickly shows up



A properly arranged, well kept shop promotes efficient, high grade work.



Accurate and complete records are a must for any well organized shop.

here. The location of machinery and work areas determines how smoothly jobs move from place to place, and the amount of handling required. A haphazard arrangement causes work to move in all directions and results in confusion, interference and delays.

Operations which are noisy, or which produce chips or dirt, should be separated from others. This may seem like a fine point, but it is important if you want to get the best out of a shop. It makes good housekeeping a lot easier and helps in concentration on specialized jobs. More and more, good housekeeping and attention to fine points are becoming the symbols of good organization.

The thorough cleaning of apparatus before it goes to the repair areas makes good housekeeping easier. Working on clean parts in well lighted, clean surroundings is good business. It promotes high standards of quality, gives the workman pride in his job, and calls forth his best efforts. A good man knows that he must keep his tools in first class shape if he is to do his best work. In the same way, a well-kept shop enables a man to do his best with the machinery and processes he uses on his job.

We all know how cleanliness and good housekeeping promote safety. Safety has always been an important consideration with railroads. This alone is an excellent reason for emphasizing the importance of good housekeeping.

Good housekeeping and records are well established practices in the stores departments of many railroads. These have been carried over from steam days, with necessary modifications for diesel-electric parts. As in the shop, the electric equipment is new here too. The care and attention given to the handling and storage of electrical materials has much to do with the success of the work in the shop. Conditions, such as temperature, humidity and location must be carefully watched when storing parts. For instance, mica parts stored on a top shelf might be useless when taken down. Why?—Temperatures near the roof in the summer time may be high enough to soften the binder, causing molded shapes to change and mica flakes to separate. Steam pipes can do the same kind of damage in the winter.

Humidity, or water from leaky walls or roofs may

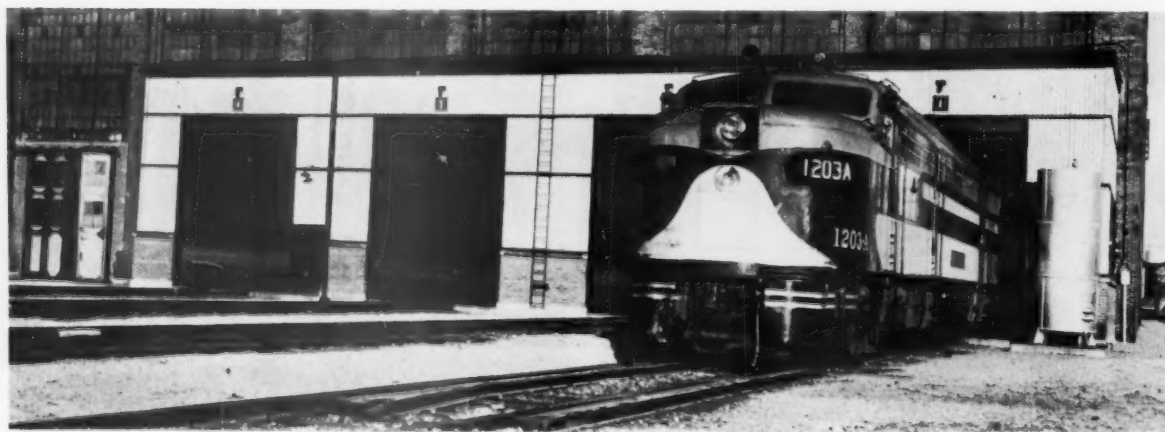
work slowly but surely on insulation. Coils, or even complete motors and generators, may be found unfit for use because of low insulation resistance. Time will have to be taken to bake and dry them out before they can be installed. In fact, equipment standing idle may suffer more than if it were in use because it doesn't have the benefit of heating in operation to keep it dry.

The location of parts is also very important. Electrical insulation is rather easily damaged if it is hit or scratched. Insulated parts should not be placed on the floor or in bins where they can be hit by passing hand trucks or by sweepers. Care should also be taken to prevent placing other material on such parts and thus damaging the insulation. Some kinds of electrical varnish will jelly if the container is stored in the direct heat of the sun. It is wise to check on the shelf life, proper storage and handling of new or unusual items when they first show up. You can expect these, because new materials are constantly being developed to meet the increasingly tougher requirements.

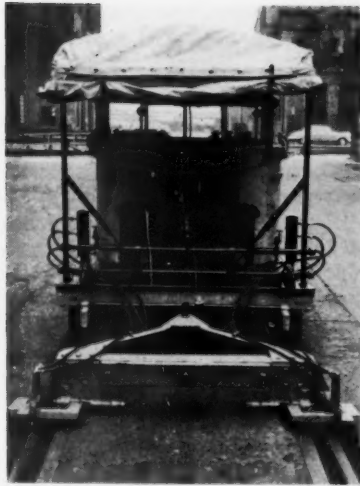
Keep Learning

No matter what your job may be, get all the information you can. Keep learning new things about it and you will keep progressing. Read up on literature dealing with your subjects. Attend meetings of groups, such as diesel clubs, associations and technical societies dealing with these new areas and problems.

Above all, be sure to get the information to the men who should be using it. This is most important. How often do instruction books, bulletins and other vital information gather dust in an office far removed from the shop floor where they are needed? This also applies to modernization instructions. Many early equipments can now be brought up-to-date. Kits are available from the manufacturer for conversion of equipment to increase its performance. In many cases the job is quite easily done during overhaul or rebuild. By taking advantage of such opportunities damaged or worn equipment can be rebuilt to give increased performance. Equipment damaged or weakened, limps into the shop and rolls out like new. Yes, thanks to modernization, in many cases it is even better than new.



Rejuvenated by its stay in the shop, equipment rolls out ready for many miles of efficient service.



End view of the car showing the relationship of the application nozzles to the track. Maintenance of way car converted for rail conditioning showing pressure tanks, gasoline-driven compressor and trailing nozzle dolly. ▶



Reading Treats Slippery Rails

And increases average tonnages 17 per cent with an estimated net saving of 25 to 40 cents per train mile

MUCH DRIVER-TO-RAIL adhesion is lost when there is high moisture and a small amount of oil or grease on a rail. The moisture serves to spread the grease over the surface of the rail in a microscopically thin slippery layer which defies removal by the driver. This fact was discovered and reported on by R. K. Allen, General Electric Company, in the October 1954 issue of *Railway Locomotives and Cars*.

It was also learned that the offending film could be removed by washing. From 1953 to 1955, the General Electric Company and the Reading ran a large number of tests to determine a means of removing this oil film in a practical and efficient manner. Laboratory investigations indicated it might be possible to remove this oil film with a high-speed detergent. A railroad maintenance-of-way track car was

equipped to wash the rail. The results were satisfactory in that on a tonnage train the number of wheel slips on the 35-mile grade could be reduced from the original range of 100 to 200 down to two or three with very thorough washing, and more importantly, thorough rinsing (*Railway Locomotives and Cars*, January, 1956). However, the cost per mile to wash and rinse the rail was prohibitive and indicated a need for some other means of eliminating or neutralizing the film.

Early in 1955, the National Aluminate Corp. (Nalco) requested permission to participate in these tests with chemicals of its manufacture which had shown considerable merit in laboratory tests. Through 1955 and a portion of 1956, joint research was established by the Reading, General Electric Company, and Nalco to progress tests

on a type of chemical, now designated as Nalco RC rail conditioner, a sprayable liquid which overcomes lubricating properties of oil film.

Several methods of applying Nalco RC were investigated. The reading has found that for its present operation the most practical method is to use a maintenance-of-way track car equipped to spray the rail.

The present rail-conditioning equipment consists of a maintenance-of-way track car equipped with two 30-gal galvanized tanks and a small compressor maintaining 40 lb pressure in the tanks. Nalco RC is sprayed on the rail at a car speed of 20 to 25 mph through a nozzle at an approximate rate of one quart per rail per mile, or ½ gal per mile of track.

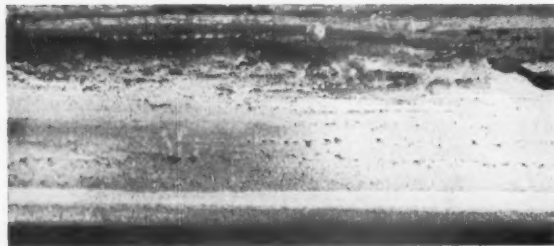
In June, 1956, encouraged by tests which indicated that operating adhesions could be raised substan-



Section of oil-contaminated rail tread before application of rail conditioner.



Section of the same rail tread after first train had passed over conditioned rail.



Section of the same rail tread after rail conditioner had been applied.

	PRIOR TO RAIL CONDITIONING	WITH RAIL CONDITIONING
Units	Three 1,600-hp	Three 1,600-hp
Train	NJ-4	NJ-4
Weather	clear	rain
Tonnage	7,275	8,279
Running time on grade	2 hr, 45 min	3 hr, 28 min
Average mph	14.29	10.29
Average ampere demand	780	850
Average rail adhesion demand*	15 per cent	16.7 per cent
Maximum ampere demand	925	1,085
Maximum rail adhesion demand*	18.5 per cent	22.5 per cent

* Corrected for a wheel diameter of 37 3/4 in.

Remarks: Prior to rail conditioning—Constant wheel slipping for entire 35-mile grade.
With rail conditioning—Occasional wheel slip primarily wheel walks. No loss of speed due to slipping.

tially with corresponding increase of tonnage, the Reading and Nalco arranged for a long-term evaluation under all operating conditions. The results have been good enough to justify incorporating the applica-

tion as part of regular operating procedure.

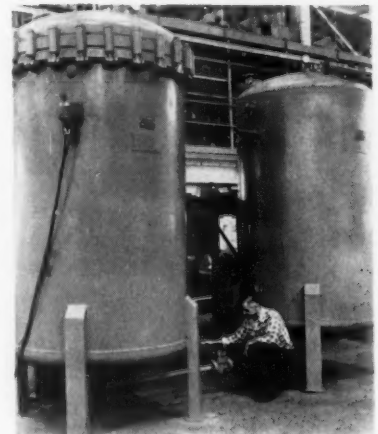
The average tons per train handled on the Catawissa Branch, eastbound prior to rail conditioning, was 6,870 tons.

During the five month period (June through October, 1956) when rail conditioner was used, a substantial increase in adhesion permitted the average tonnages to be increased by approximately 17 per cent, thereby permitting greater utilization of motive power.

The table shows the performance of two selected trains, one of which was operated in clear weather prior to rail conditioning and the other in adverse weather with rail conditioning.

The Reading estimates that the average net savings vary from 25 to 40 cents per train mile, depending on the available tonnage to be moved eastward on the Catawissa Branch.

IMPREGNATOR FOR PAKISTAN.—One of the largest vacuum impregnating systems ever built will shortly be placed in service by the government of Pakistan Railways at Karachi. Supplied by the F. J. Stokes Corporation, Philadelphia, Pa., the equipment will be used to impregnate with insulating varnish the armatures and field coils of diesel-electric locomotive traction motors. The tank at the left, the impregnating chamber, is 58 in. in inside diameter, 9 ft in height, with a maximum immersion height of 87 in. The varnish storage tank or reservoir at the right has a capacity of 1,120 gal. Impregnation with the aid of vacuum insures deep and thorough penetration of the insulation varnish into the voids in the coil. After impregnation, the armature or the coil is removed from the vacuum chamber and the varnish is dried to maximum hardness by baking it slowly for 16 to 18 hours at a temperature of 140 to 150 deg C. The treated component then gets a further coat of red enamel Glyptal varnish by dipping it and then baking it another 12 to 18 hours at 120 to 150 deg D.



The vacuum impregnator is shown at the left and the varnish storage tank at the right.

Air Conditioning Failures Cut in Half

Instruction cars, improved equipment and good management combine to greatly improve Pullman service and reduce costs

THE PULLMAN COMPANY has made a major effort in recent years to improve the overall performance of its equipment. This is strikingly presented by the performance of air conditioning equipment on Pullman cars.

During the cooling season from March 1, 1953 through October 1953, there were 3,010 cooling failures, whereas during the same period of 1956, the failures had been reduced to 1,361. This reduction of 1,649 failures certainly means many more satisfied users of Rail-Pullman service with resultant goodwill.

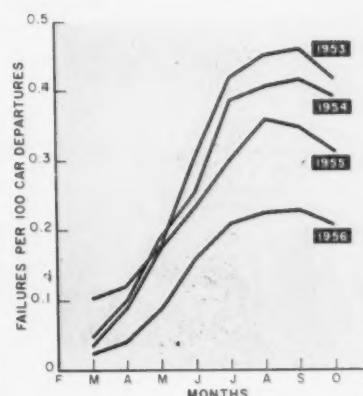
Concentration on education of employes and setting up competition between the Pullman Company districts has been a basic part of the program to obtain better performance. The education feature is based on a Maintenance Manual consisting of concise instructions including pictures of detailed parts of the various systems. The Manual is in loose-leaf form, so the instructions can be implemented quickly as required. The Manual contains a "servicing procedure" which is the maintenance man's guide as to when each of the items of equipment must be inspected or tested at regular time intervals. It assures uniformity of instructions at all districts in the country. The instructions in the Manual are supplemented by on-the-ground training wherever trouble exists or a need is shown.

Reporting of failures in the early

days of air conditioning was not too complete, so the reports have now been keyed to direct happenings on the particular car. A report on every failure is in the chief mechanical officer's hands within two days and a follow-up of the failure is automatically carried through to districts to which the car may be dispatched. This has resulted in practically eliminating cases of an individual car failing repeatedly without attention. For purposes of analysis, the causes of failure are immediately sent to those districts from which a car which failed was dispatched. In this way, those responsible are made aware of the cause of the defects. This puts in the hands of each district an up-to-date running record of all failure cars dispatched from their particular district.

For the cars maintained by the Pullman Company, a record is kept not only of the failures, but also of the departures so that each Pullman district has its own "batting average" which is compared with that of other districts in the country. This is extended to make a comparison of the various regions' performance and the net result has been a fine competitive spirit all the way down the line. A table showing this and graph made up from the data included in the table shows how cooling failures have consistently decreased during the past four years until there were less than half as many in 1956 as there were in 1953.

The result of this competition is



that each failure is completely analyzed and promptly acted upon. The information being basic, is very valuable and the nation-wide incidence of each type failure is catalogued for general office meetings with the regional representatives. These are held each fall to determine action to be taken on work to be done during the winter season for improvement the following year.

Perhaps the biggest single improvement in the educational facilities of the Pullman Company has been the advent of a three-car mobile instruction unit. This unit includes most of the devices used for air conditioning and electric lighting in the sleeping cars. These devices are set up for actual "On Car" operation to provide visual education as supplement to the maintenance manual and the other training programs. This unit went into service September 1955 and since that time, instruction classes have been held in 12 terminals along the eastern seaboard, southern and Texas points. Lectures and demonstrations have been given to Pullman employes as well as employes from interested railroads and terminal companies. Present indications are an improvement in air conditioning occurred on cars being serviced at points where the instruction classes have been held.

Other factors which have served to improve air conditioning performance consist of converting some of the older systems to the improved

	1953	1954	1955	1956
March .....	.103	.047	.059	.026
April .....	.121	.099	.091	.042
May .....	.181	.185	.180	.087
June .....	.304	.256	.236	.161
July .....	.419	.387	.301	.210
August .....	.448	.405	.360	.226
September .....	.457	.417	.349	.228
October .....	.417	.392	.314	.209

post-war electro-mechanical type. A good example is the high cost, high failure dynamotor type recently converted. Meetings held with various railroads and railroad suppliers have been helpful in eliminating certain troubles, particularly on design prob-

lems. The extended use of automatic washing machines for cleaning air filters has reduced air circulation problems and new types of electrical testing devices, etc., have helped in the overall improvement.

The challenge raised by the many

types of cooling systems with the numerous variations in control panels and complex electrical circuits is being met successfully. Improved knowledge of the equipment, together with continued attention to basic ideas is the key to success.

From the Diesel Maintainer's Note Book

The Diesel Runs a Fever

By Gordon Taylor

THE CAUSE OF THIS TROUBLE WAS unusual and is the first of its kind in our case record.

An F-7 Electro-Motive diesel was dispatched from its maintenance terminal apparently in good working order. A short time later the crew was startled to hear the alarm bell ring.

Checking the units to see what was wrong, the fireman found the red alarm signal light burning in one of the trailing units. This, of course, indicated a high temperature in the engine of that unit.

The crew followed regular instructions for checking a hot engine alarm. They checked water level, radiator shutters and fans. All seemed to be as they should be, and the temperature gage did not indicate a temperature of 200 deg, or more, which it would have to be, to cause a hot engine alarm.

In checking further, it was noted the hot engine alarm sounded only when working the unit in the No. 8 throttle position. The crew continued the trip figuring they were getting a false alarm.

The crew made a note on the trip report calling the maintainers' attention to need of checking the cause of the hot engine alarm.

The maintainers checked the unit on its return to the diesel house, but could find nothing wrong. The engine temperature checked properly, and the hot engine alarm failed to sound, so the unit was again returned to service.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

Apparently the maintainers failed to make a complete check for trouble, since the crew again got a false alarm indicating hot engine, while the temperature was found to be within reasonable limits.

The maintainers received a second trouble report on this unit and our ace trouble-shooter checked to see what was wrong.

It did not take him long to discover the cause as being due to a defective hot engine alarm switch, E.M.D. part #8099702. What caused it to fail is interesting, as well as instructive.

This switch is a thermal type switch, normally open. It has a feeder bulb located at the water outlet manifold of the engine. The bulb is filled with a heat sensitive gas or liquid which expands or contracts in direct proportion to the temperature to which it is exposed. The feeler bulb is connected by a small capillary tube to the diaphragm in the switch.

When the water temperature in the engine water outlet exceeds 208 deg F, the expansion of the liquid or gas in the bulb, transmits pressure against a diaphragm in the switch. When the switch closes, it lights the hot engine alarm signal light, and energizes the signal relay which rings the alarm bell.

When the inspector checked the hot engine alarm switch, he carefully checked the capillary tube to be certain it was not kinked, broken or otherwise damaged. Seeing nothing wrong with the tube, he removed the feeler bulb at the end of the tube from its housing in the engine water outlet.

He discovered that the bulb was



damaged — apparently by erosion which had opened the bulb wall, allowing the operating liquid or gas to leak away. The bulb and tube were thus exposed to entry of water from the engine cooling circuit. This permitted water pressure to work into the tube and exert pressure against the operating diaphragm in the switch.

The engine was then started up and placed in the No. 8 throttle position. When the water pressure reached a value of 26 psi, the hot engine alarm switch closed. In other words, water pressure instead of water temperature was causing the alarm system to send out a false alarm indicating a hot engine.

Replacing the defective high temperature alarm switch corrected the trouble, and the engine no longer worried about its fever and went on about its business as though nothing had happened.

Before the case can be completely closed, it will be necessary to discover what may cause such erosion and opening of the feeler bulb. That is something to watch for in the future.

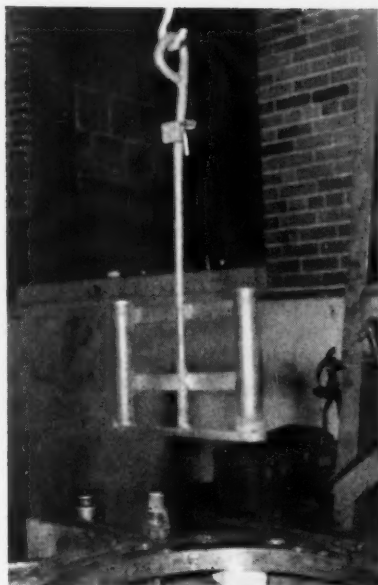


Fig. 1—Device for holding main pole pieces.



Fig. 2—Main pole piece suspended on hoist ready for lowering into the motor frame.

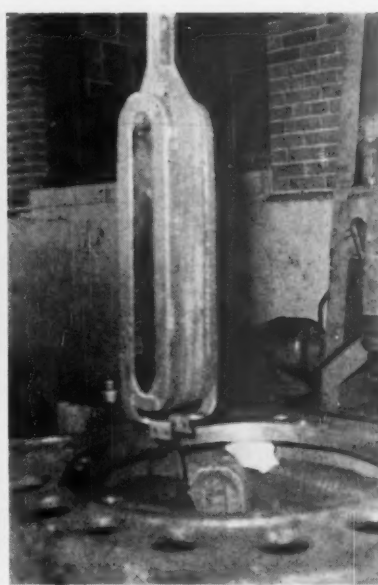


Fig. 4—A loop of webbing is used to handle interpoles.

Erie Shop Has Easy-In for Pole Pieces

TWO SIMPLE DEVICES which make the application or removal of traction motor main poles and interpoles a relatively simple operation are shown in the four illustrations. They were developed in the Marion, Ohio,



Fig. 3—When the threaded rod is screwed into the center hole in the pole piece, it can be pulled into position.

shops of the Erie and their use has been adopted as regular procedure.

The device for handling main poles is shown in Fig. 1. Welded to the center lifting rod, which has an eye at the top, is a bottom plate and two cross members which in turn are welded to two short sections of pipe. There is a small L-shaped piece having a hole slightly larger than the rod which is free to slide down on the rod to a stop as shown.

The two sections of pipe are so spaced, and of such a size, that they fit into the main pole piece grooves as shown in Fig. 2. The bottom plate then comes in contact with the lower edge of the pole piece and the L-shaped piece slides down over the upper lip of the pole piece to hold it vertically as shown.

The pole piece is then lowered into the motor frame and a rod, having threads corresponding to those on the pole piece cap screws, is pushed through the center cap screw hole and screwed into the pole piece as shown in Fig. 3. The curved outer end of the rod serves as a means for turning the rod. The pole piece is then pulled into place with the rod and the two outer cap screws can be applied without difficulty. The rod is then removed and the center cap screw applied.

The interpole pieces are handled by means of a strap made of webbing. The strap which is just wide enough to fit between the interpole coil terminals is in the form of a loop which fits over the coil as shown in Fig. 4. The threaded rod is used in the same manner to position the pole piece.



HAULING WITHOUT DOWNTIME. This 70-ton diesel-electric locomotive has operated more than 8,000 hr without downtime in extremely dusty conditions at temperatures ranging from below zero to above 100 deg. at U. S. Gypsum's Empire plant at Empire, Nev. Scheduled daily maintenance has helped the unit make 2 trips a day, 6 days a week, without fail for 26 mos.

24-RL Brake Equipment

This is a new series of Questions and Answers pertaining to recent developments in the 24RL air brake equipment for road locomotives. The first questions will deal with the Pressure Maintaining feature. Authorized persons may obtain information on this subject in Instruction Pamphlets 2606-1, and 2601-1 Supplement 1 by communicating with their nearest Westinghouse Air Brake representative.

R53-Q—What then takes place?

A—The interlock cut-off valve moves forward compressing its spring.

R54-Q—What results from this movement of the piston?

A—Brake pipe air from passage 2a is cut off by the piston which then connects the chamber above the maintaining cut-off valve piston to the exhaust.

R55-Q—How does this action affect pressure maintaining?

A—Pressure maintaining is inoperative as the spring below the piston causes it to move up taking its stem away from contact with the cut-off check valve which is seated by its spring. Feed valve air is thus cut off from passage 14a to the equalizing portion.

R56-Q—Describe the initial flow of air at the brake valve cut-off valve (double-heading cock) assembly in IN position.

A—With the pilot valve handle in IN position the pilot valve piston is positioned to permit flow of main reservoir air from passage 30, through a passage in the piston and into a passage leading to the cut-off piston chamber (57).

R57-Q—What action then takes place?

A—The cut-off piston is moved toward the spring chamber end, compressing the piston spring.

R58-Q—What air connections are made in this position?

A—Brake pipe air from passage 2 is connected to passage 1 to pipe 1 to the main brake pipe.

R59-Q—What other air connections are made with the lever in IN position?

A—Main reservoir pressure in passage 10a from the spring chamber above the service application piston is connected through a cavity in the pilot valve piston to passage 10 to pipe 10 to the safety control system.

R60-Q—What flow of air takes place with the pilot valve handle in OUT position?

A—The Pilot Valve Piston is now positioned to cut off main reservoir air from passage 30, and connects the cut-off piston chamber to atmosphere.

R61-Q—What then takes place?

A—With the air removed from this chamber, the cut-off valve spring moves the valve away from the spring end of the bushing.

R62-Q—What results from this movement?

A—Passage 2 is cut off from passage and pipe 1 and the brake pipe.

R63-Q—What other connection is cut off at this time?

A—Passage 10a from service application portion is cut off from passage and pipe 10 and the safety control system by the pilot valve piston.

R64-Q—What air flow takes place when the pilot valve lever is moved from OUT to MID position?

A—Main reservoir air is supplied to passage and pipe 10 to the safety control system.

R65-Q—Why is this action required?

A—The safety control system must be recharged before cutting in passage 10a connected to service application piston chamber and to passage and pipe 10 to the uncharged safety control system.

R66-Q—What would be the result if the handle were brought from OUT to IN position without pausing in MID position?

A—Air would be drawn suddenly from above the service application piston. Main reservoir pressure beneath the piston would cause the piston to rise and initiate a service safety control application.

R67-Q—What does automatic service position of the brake valve produce?

A—The proper rate of brake pipe pressure reduction to cause a service brake application.

R68-Q—What initial flow of air takes place when the brake valve handle is placed in service position?

A—The exhaust port in the rotary valve seat registers with passage 4, allowing chamber D and equalizing reservoir pressure above the equalizing diaphragm to escape through the exhaust to atmosphere.

R69-Q—What action results from the reduction of air above the diaphragm?

A—As all other ports are closed, the fall of pressure in chamber D causes brake pipe pressure beneath the diaphragm (703) to move diaphragm follower (704), clamping plate (705) and attached plunger upward.

General Motors

Diesel-Electric Locomotives

This series of Questions and Answers pertains to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Freezing Weather Precautions.
Manual 2310, Page 223.

G573-Q—What must be done in freezing weather if an A unit is shut down and train line steam is available?

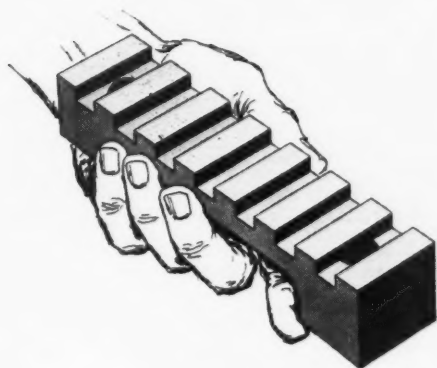
A—The steam admission valve into the engine and the G valve on the cooling water supply tank must be opened.

G574-Q—Where is the steam admission valve located?

A—On the engine room floor at the left front corner (governor end) of the engine.

How R-S JOURNAL STOPS will further Reduce Solid Bearing Operating Costs

and pay for themselves in less than 3 years!



Tests have proved that this new device will greatly improve bearing performance and journal lubrication, will at least double bearing life, reduce wheel flange wear and make other significant savings in freight car operation.

STABILIZE the solid bearing assembly and you approach the maximum in bearing performance. You do just that with R-S Journal Stops. Best of all, they pay for themselves in less than 3 years. Here's how:

First, you reduce routine yard servicing and oiling requirements. Packing seldom needs adjustment, and you don't need oil so often either. (Other lubricators, pad or mechanical, will benefit, too). You cut car oilers' time in half, and inspectors' time by as much as 25%. When enough cars are Journal Stop equipped that could mean savings close to \$18.00 per car per year.*

Second, all indications point to 3-year periods between periodic attention as required by Rule 66. That would cut current costs in half — save as much as \$6.00 per car per year.

Third, and conservatively, you'll reduce road repair costs to a third of what they now are — possibly a great

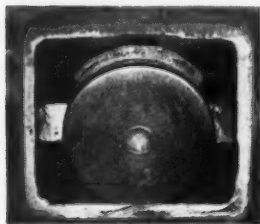
deal more. That means minimum savings of \$6.00 per car per year.

Fourth, you'll cut bearing consumption in half — use less than 1½ bearings per car per year. In annual savings that will mean about \$4.00 per car.

The above four items alone represent potential annual savings of \$34.00 per car. Add to these the tremendous savings due to reduced wheel flange wear and a 3-year recovery estimate is probably conservative.

One private car company whose total savings are determined largely by billings that don't cover servicing costs, has already estimated recovery of total installation costs in less than 3 years. Operating roads will save even more. Write us today for full information. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

*These and other estimated savings are based on unbiased studies of AAR solid journal bearing operating costs.



Unretouched photo of the RS Journal Stop installation with conventional waste packing. Other lubricators are similarly "contained."

MAGNUS Solid Bearings

MAGNUS METAL CORPORATION

Subsidiary of NATIONAL LEAD COMPANY



QUESTIONS AND ANSWERS

G575-Q—With what other valve could the steam admission valve be confused?

A—The engine drain valve.

G576-Q—Referring to Fig. 2-4, what valves should be operated?

A—Close valve 3 and open 2 and 7. Valve 4 should be closed, valve 9 cracked open, to allow condensate to drain.

G577-Q—What steps are necessary on a B unit?

A—On a B unit, it is only necessary to open the steam admission valve and the G valve to accomplish the same purpose.

G578-Q—What must be done if trainline steam is not available?

A—The entire system must be drained.

Engine and Steam Generator Inoperative.

G579-Q—What valves on the engine cooling system must be opened in this case if steam is supplied from an external source to prevent freezing?

A—The steam admission valve to engine cooling water, the steam supply valve to cab heaters, the G valve, and the toilet water tank valve.

G580-Q—What valves to the steam generator should be opened?

A—The heating coil valve, the water suction line valve, and the water tank valve. For detailed instructions see Section 6-Manual 2310.

G581-Q—From what should water be drained if heating facilities are not available?

A—The engine cooling system, cab heaters, steam generators, steam generator water tank, toilet water tank, and the G valve.

G582-Q—What else should be drained in this case?

A—The air system.

Manual 2310, Page 224.

G583-Q—What parts of an air compressor should be drained?

A—The oil separator and the inter cooler.

G584-Q—Which reservoirs must be drained?

A—The No. 2 main reservoir under cab floor and upper and lower sump reservoirs.

G585-Q—What other parts should be drained?

A—The type H filter, electrical control air regulator, electrical control air reservoir, and the strainer at the engine control electrical panel and electrical control cabinet.

Splitting and Joining Units.

G586-Q—What must be done first when splitting units?

A—All jumpers must be taken down (inside and outside the diaphragm).

G587-Q—What else should be done?

A—Angle cocks or cocks on both units should be closed on all air hose and hose to separate units broken by uncoupling.

G588-Q—What must first be done when joining units?

A—After coupling, units should be stretched to insure locking of couplers.

G589-Q—What should follow?

A—Hose and jumpers should be connected and all angle cocks and cocks on all hose opened in both units.

G590-Q—What else should be done?

A—Brakes and all control switches should be cut out in all but operating unit and reverse lever in trailing A unit removed.

Towing Locomotive.

G591-Q—What must be the position of reverse lever on a locomotive to be towed?

A—The reverse lever must be in the *neutral* position.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Bulletin 1706, Sec. 104A, Page 7.

F499-Q—What should follow?

A—Reverse handle should be inserted and air brake tests made.

Operating with Leading Unit Shut Down

F500-Q—What do you do at the leading unit in this case?

A—Snap off control and fuel pump breakers at the leaf unit engineer's breaker panel.

F501-Q—What do you do at the trailing unit?

A—Snap the respective breakers on.

F502-Q—What action should be avoided?

A—Avoid having both ends on at the same time.

F503-Q—What harm may result from disregard of above?

A—Battery equalizing currents may be enough to damage control wiring.

F504-Q—What should be done in case any heavy knocking or any other unusual noise from the engine is apparent?

A—The engine should be shut down at once.

F505-Q—What should be done at the derailed truck?

A—The traction motors should be cut out.

F506-Q—What care must be taken during rerailling?

A—Care must be taken to prevent the wheels from slipping off the frog during rerailling, to avoid serious damage to the traction motors or gear cases.

Dynamic Braking
Operation of Controls

Bulletin 1706, Sec. 110-A, Page 1.

F507-Q—When dynamic braking what should be done with respect to the number of units in the locomotive?

A—The dynamic brake unit switch behind the engineer's seat should be set for the number of units in the locomotive.

F508-Q—What else should be done?

A—The dynamic brake circuit breaker on the panel behind engineer should be in the *on* position.

F509-Q—What does this breaker control?

A—This breaker controls the field loop excitation circuit.

F510-Q—What should be done upon entering dynamic braking?

A—Upon entering dynamic braking, always wait a few seconds in each control stop before proceeding.

F511-Q—Why is this delay necessary?

A—To prevent excessive current surges and motor flash overs.

F512-Q—With what other medium can the train retarding action of the dynamic brake be compared?

A—The dynamic brake retards the train similarly to a strong independent brake, so that the same care must be used in controlling slack.

F513-Q—With the dynamic brake circuit breaker in *on* position what should be done next?

A—The throttle should be placed at *idle*.

Name
the load
on your
road

there's a
Yellow Strand
**Safety Sling to
handle it!**

Any load you have to handle is a load for Yellow Strand Braided Safety Slings.

Yellow Strand Braided Safety Slings are strong, flexible, easy to attach. Special braiding methods keep safety factors high. High-quality Yellow Strand Wire Rope assures longer life.

They can be tailor-made to specifically fit your needs. Just ask your Broderick & Bascom distributor, or write direct to us for specific sling information.



Diesel switch engine is safely and easily lifted with four M-1-AB Yellow Strand Braided Slings; each sling is 8 parts $\frac{3}{4}$ " rope, 14 feet long.

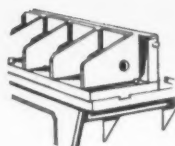
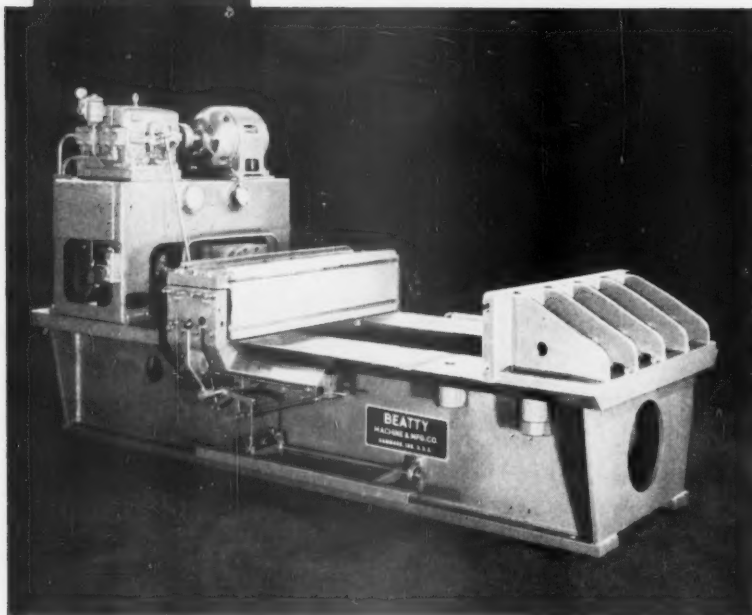
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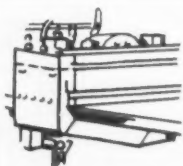


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BEATTY RAPID PRODUCTION HORIZONTAL HYDRAULIC BULLDOZER & RETURN SPEEDS BOOST OUTPUT



Resistance bolster is keyed and bolted to table for die space change or use of special bolsters.



Ram guides are mounted in V's beneath table surface.

Featuring rapid production and return speeds: advance — 262" per min.; press — 29" per min.; return — 385" per min. . . . this 200-ton Beatty press offers you more dependable, accurate production per man-hour. A compact, self-contained unit, it is very highly regarded for heavy metal working — forming, bending and straightening.

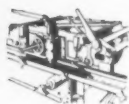
The machine is constructed of rolled steel plate, with a single-acting type main cylinder of high grade forged steel, bronze-bushed and recessed for chevron type packing. Your choice of foot or hand lever controls.

Write For Full Details

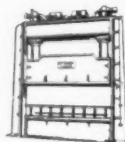


BEATTY
MACHINE & MFG. CO.

962 150th St.
HAMMOND, IND.



Spacing Table



Vertical Bulldozer



Heavy Duty Punch

SUPPLY TRADE NOTES

(Continued from page 20)

sion, National Bearing Division, Ramapo Ajax Division, and Southern Wheel Division.

John S. Hutchins, executive vice-president and director of American Brake Shoe, has overall responsibility for the new division. He was formerly president of both Ramapo and National Bearing Division.

Stephen S. Conway, a Brake Shoe vice-president and president of the Brake Shoe & Castings Division, has been named president of the new Railroad Products Division. Eads Johnson, Jr., president of Southern Wheel Division, is vice-president, sales. Roy L. Salter, first vice-president of Southern Wheel Division, has charge of the production department. Raymond A. Frick, vice-president, Brake Shoe & Castings Division, is assistant vice-president of production. The engineering department is headed by Rosser L. Wilson as vice-president. Mr. Wilson has been director of mechanical engineering at the Mahwah research center and vice-president and chief engineer of Brake Shoe & Castings Division.

Within the new Railroad Products Division, four staff product managers supervise the lines of products offered by each of the former divisions. They are Joseph P. Kleinkort, for the Racor line of trackwork and specialties; John F. Ducey, Jr., brake shoe product line; Daniel C. Poor, wheel products; and Harry E. Connors, bearing products.

Three regional sales areas are being established. Sam R. Watkins has been named head of eastern region sales at New York; Ralph L. Robinson, central region sales at Chicago; and Westlev C. Muller, western region sales at San Francisco.

LINK-BELT COMPANY.—District sales managers have been transferred as follows: George A. Most, Jr., to Boston; J. Charles Bullock to Moline, Ill.; Gene A. Zwerner to Albany, N.Y.; C. C. Wiley to Washington, D.C., and Paul Waldorf, a sales engineer, appointed district sales manager at Baltimore.

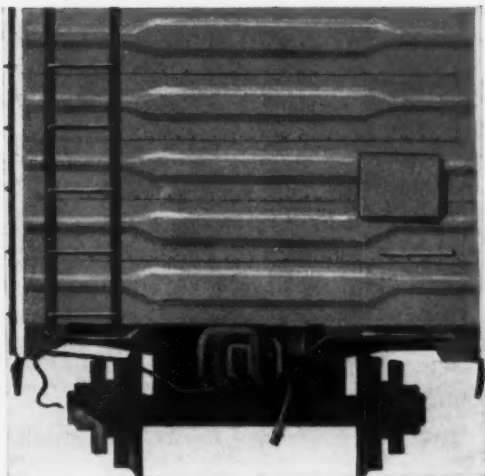
DANA CORPORATION.—G. Leonard Smith, has become mid-western representative at Chicago.

GIDDINGS & LEWIS MACHINE TOOL COMPANY.—John M. Dolan, has been appointed vice-president-general manager, field sales division.

W. H. MINER, INC.—R. J. Olander, assistant to vice-president, mechanical, has been appointed director of Miner's Research and Development Department.

OKONITE COMPANY.—Robert B. Zane, district engineer at Chicago, has been appointed railroad sales manager for the Chicago district.

CRUCIBLE STEEL COMPANY OF AMERICA.—The Spring Division has moved its sales headquarters from New



Look Under Your Cars



... see why Armco Wrought Steel Wheels pay off



Special wheel steel, toughened by forging and rolling, packs extra service miles into every Armco One-Wear Wheel. That's why they're economical—give you more service in return for your wheel dollars.

Prove it to yourself. *Just look under your cars.* The date stamped on the back of the rim of each Armco One-Wear Wrought Steel Wheel tells you when it was made. Inspection of the tread contour will show its resistance to wear. Most likely you'll find plenty of service metal left in spite of its years on the rails.

More difficult to measure, but just as important, are these day-to-day advantages you get from Armco One-Wear Wrought Steel Wheels: Faster freight schedules to satisfy shippers, greater safety, and no maintenance.

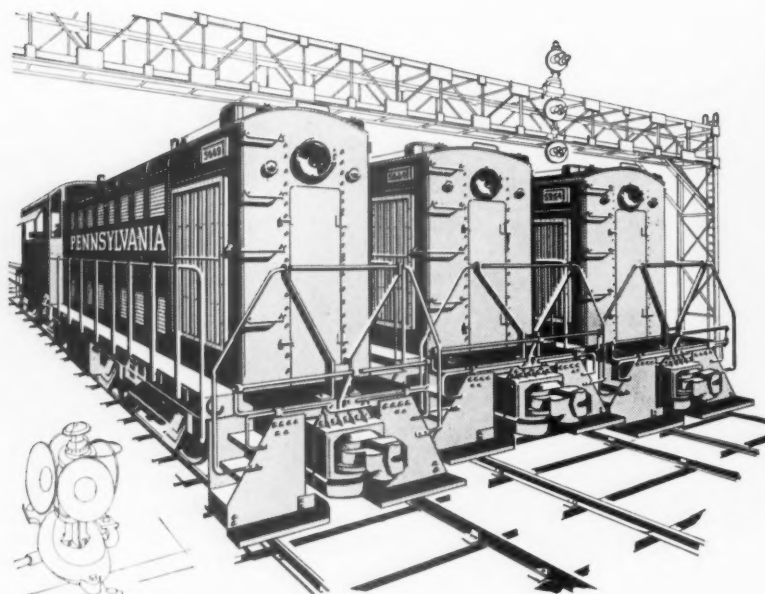
Just call the nearest Armco Sales Office, or write us, for full information about long-lasting Armco Wrought Steel Wheels.



ARMCO STEEL CORPORATION

2116 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION



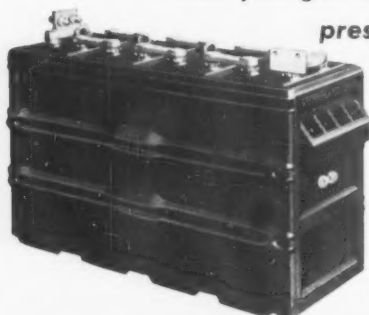
No water added to **C&D Diesel starting batteries in 16 months!**

These three PRR Diesel switchers have one thing in common—their powerful C & D Slyver-Clad® starting batteries haven't been watered in more than 16 months!

Why? Because these rugged railroad batteries have lead-calcium plates—the most outstanding battery development in 50 years. Lead-calcium batteries are free from the antimony "poisoning" that shortens the life of conventional lead-antimony batteries. Lead-calcium batteries require far fewer water additions because they use 1/10 as much water as conventional batteries.

Add this remarkable plate alloy to C & D's Five-Fold Slyver-Clad insulation and retention which has virtually eliminated shedding, and you have the finest Diesel starting battery available.

Can you get this in your present Diesel starting battery?



- Up to 50% more life than conventional batteries?
- Once a year water additions?

If your present Diesel starting batteries don't measure up—it will pay you to investigate C & D. Write for Bulletin DL-577/56.

C&D BATTERIES, INC.
of Conshohocken, Pa.

SINCE 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST



R. C. Lawson

York to Pittsburgh. W. K. Krepps has been appointed assistant to the general manager and Richard C. Lawson, sales manager of the division. Mr. Krepps will be located in New York.



A. J. Marcussen

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—Arthur J. Marcussen has been appointed district sales representative, Chicago region. Mr. Marcussen was previously sales engineer in the rebuild section.

HYATT BEARINGS DIVISION.—Albin D. Edelman has been appointed assistant chief engineer-railroad bearings, and Ralph Altson chief design engineer-railroad division. Mr. Edelman, who succeeds Richard J. Brittain, on extended leave of absence, was formerly division engineer-railroad bearings, and Mr. Altson was drafting group supervisor.

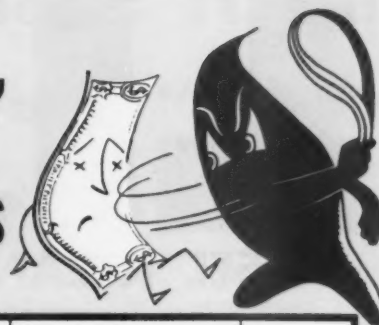
NATIONAL CARBON COMPANY.—William C. McCosh, manager of the central division of carbon products sales at Chicago, has been named manager of railroad and industrial brush sales at New York.

OGONTZ CONTROLS COMPANY.—Bruce C. Gunnell has been appointed railroad representative in the southeastern states.

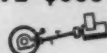
SPRAGUE DEVICES, INC.—Lawrence E. Vogt has been appointed sales manager.

EDGEWATER STEEL COMPANY.—Edgewater has opened a new St. Louis district office in the Railway Exchange

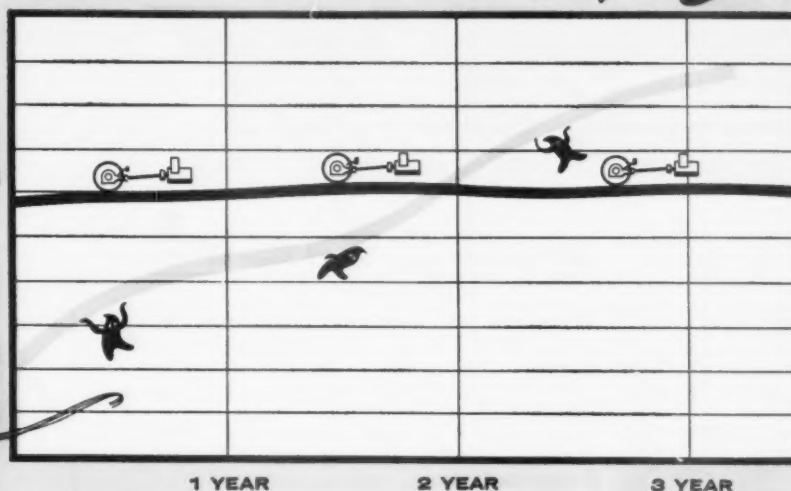
Don't get "belted" by belt drive generator costs



SPICER DRIVE \$500



BELT DRIVE \$250



Get the actual costs between belt-drive and Spicer Positive-Drive Generators . . . and find out what belt drives really cost you!

How much are replacement belts going to cost you?

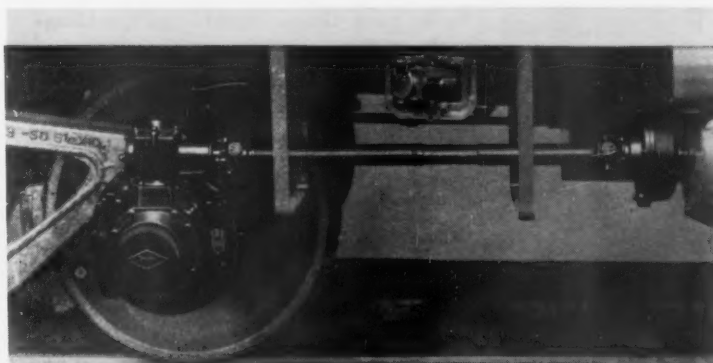
How often will they need replacement?

How much will labor for belt replacement cost?

How much will depleted batteries and shorter battery life due to belt failure cost you?

How much will loss of communications and its subsequent dangers cost you?

These are constant and continuing belt cost factors you cannot escape. Investigate the long-life economies and dependable performance of the Spicer Positive Generator Drive before you buy! Five ratios available for driving all makes and types of generators up to 5 KW.



Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.

DANA CORPORATION
Toledo 1, Ohio



SPICER PRODUCTS: TRANSMISSIONS
UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES
TORQUE CONVERTERS • GEAR BOXES • POWER
TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL
CAR DRIVES • RAILWAY GENERATOR DRIVES
STAMPINGS • SPICER and AUBURN CLUTCHES
PARISH FRAMES • SPICER FRAMES

LIX

DIESEL KLEAN HEAVY IS

SIX

ways better!

SAFER IN BODY CONTACT

Inhalation tests, skin absorption tests and oral toxicity tests conducted by one of the nation's leading research laboratories prove that Lix Diesel Klean Heavy is of low toxicity.

SAFER FROM STANDPOINT OF FLAMMABILITY

Because of its high flash point, Lix is NOT A FIRE HAZARD.

SAFER FOR ALL DIESEL PARTS

Lix is HARMLESS TO ALL METALS during cleaning cycle.

FASTER

Lix REDUCES CLEANING TIME and LABOR to very minimum. No brushing or scraping necessary. Just SOAK parts in Lix and rinse with water or mineral spirits. All types of metals can be cleaned in one tank.

CLEANS BETTER

Lix CLEANS MORE THOROUGHLY. Dirtiest engine parts cleaned quickly as sparkling-bright as new.

SAVES MONEY

Lix is actually FAR MORE ECONOMICAL in the long run than less expensive cleaners because of the long life without frequent new charges. This long-run saving in operating costs is one of the reasons why more and more railroads are relying on Lix Diesel Klean Heavy for cleaning aluminum and cast-iron pistons, fuel filters, cylinder heads, brush holders, airbrake assemblies, etc.

Write, wire or phone for a no-cost, no-obligation DEMONSTRATION in your shop. Let a Lix representative show you how you can do a better locomotive-cleaning job faster, more safely, and at less cost!

Manufacturers of Lix Diesel Klean Heavy
and Lix Electric Equipment Cleaner

THE



CORPORATION
(OF MISSOURI)

716 EAST 85TH STREET, Dept. RL-2
KANSAS CITY, MISSOURI

"Leadership in Industrial Cleaning"

Building, where P. H. Yorke, of the Pittsburgh sales staff, has been appointed district manager. D. W. Odiorne, who formerly covered the St. Louis territory, continues as district manager at Chicago.



A. C. Brown



D. D. Spoor



J. J. Lincoln

AIR REDUCTION SALES COMPANY.

—A. C. Brown, Jr., general sales manager, has been named vice-president, eastern region, with headquarters in New York. D. D. Spoor, equipment sales manager at New York, has been appointed vice-president, midwestern region, with headquarters in Chicago. J. J. Lincoln, Jr., vice-president at New York, has been named vice-president, southern region, with headquarters in Houston, Tex.

Air Reduction has acquired the assets and business of Jackson Products, (Continued on page 82)

How Shelby Seamless Tubing makes a "Buck" go farther

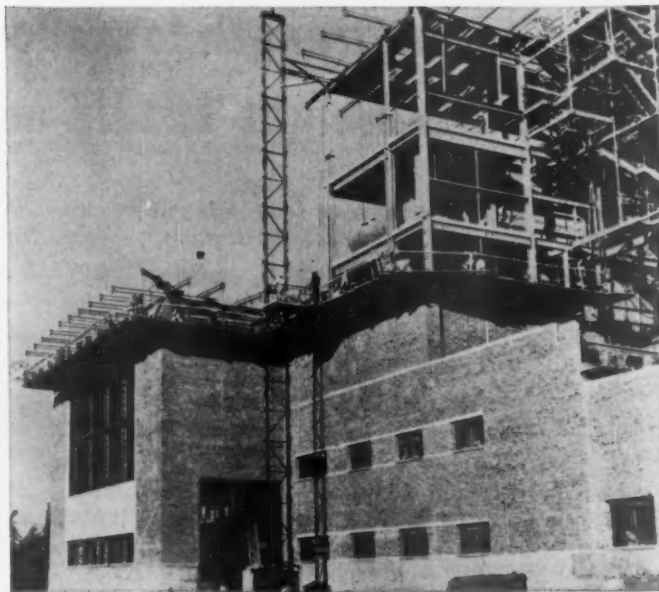
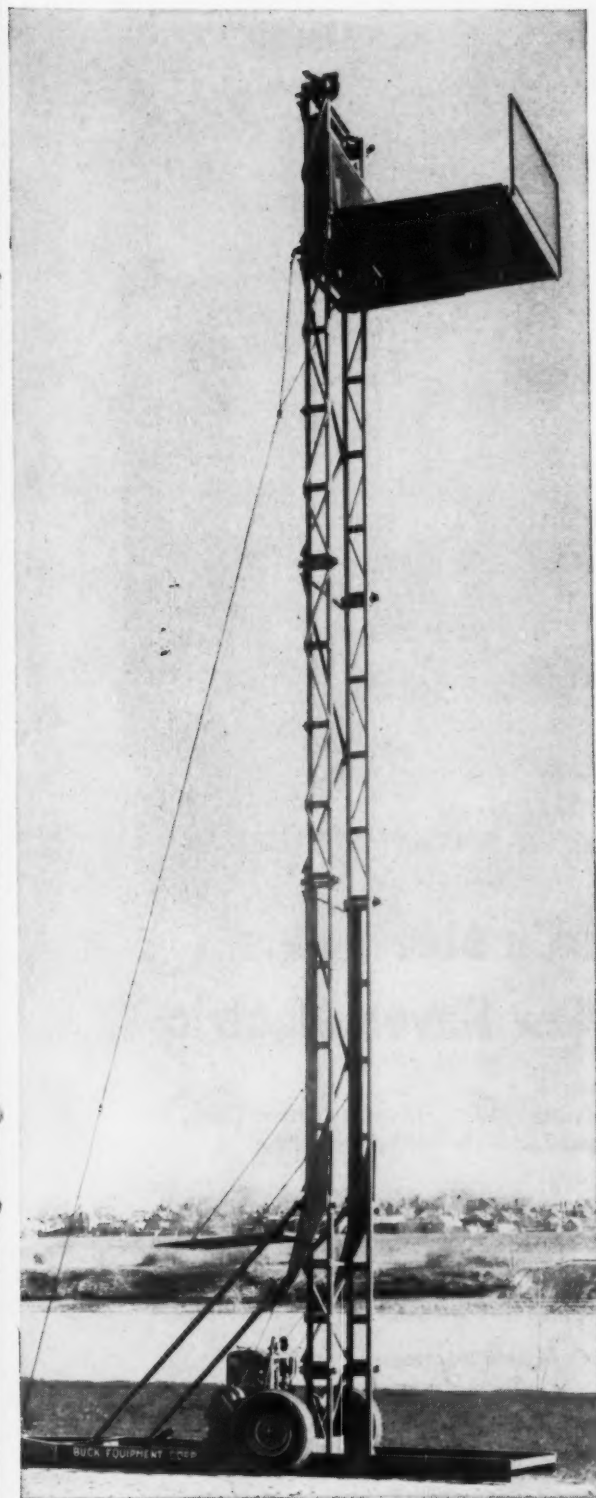
The platforms of these Buck Equipment Corporation Hoisting Machines* *do* go farther—farther *up*, thanks to Shelby Seamless. Although standard tower heights range from 25 to 40 feet, some of these unique heavy-duty rigs boast towers up to 150 feet in height!

The slender tower of the Buck Portable Hoisting Machine is constructed of 2 $\frac{3}{8}$ " OD x .120" wall, cold drawn sections of Shelby Seamless Mechanical Tubing, which afford both the structural support for the equipment and the track on which the platform moves. Self-erecting, the tower unfolds like a jack-knife—raises or lowers in 2 minutes, 11 seconds. Operating power is supplied by a 21 H. P. air-cooled engine.

Here is an application where the use of seamless tubing is virtually mandatory. What other material could supply the combination of high strength, light weight, and flexibility needed to make a completely portable hoist that would unlimber in minutes, then send a 2000-pound load of building bricks soaring up its vertical track at the rate of 140 feet per minute?

Shelby Seamless Tubing possesses the strength, uniformity and dimensional accuracy that make it ideal for structural applications such as this. Produced to exacting standards by the world's largest manufacturer of tubular steel products, Shelby Seamless is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses. You are invited to consult our engineers at any time. They will make a study of your product requirements and will help you to apply Shelby Seamless to your specifications.

*Manufacturer's name on request.



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK



SHELBY SEAMLESS MECHANICAL TUBING



UNITED STATES STEEL



BEFORE...AND AFTER MAYARI R STEEL

High strength low alloy Ni-Cu steel helps cut deadweight 19% in new New Haven electric

That crack streamlined electric at the right weighs 81,500 pounds less than the '37 locomotive.

This impressive 19% weight reduction was brought about through design improvements made possible with Mayari R—Bethlehem's nickel-copper high strength low alloy steel.

High yield point key factor in variety of structural weight reductions

Mayari R has a yield strength of 50,000 psi minimum in most commonly used sections, in the as-rolled condition. This— together with its good resistance to corrosion, abrasion and impact— permits safe weight reduction in side sheets . . . platform . . .

main and side sills . . . top and bottom plates and other important structural components.

If you want to reduce deadweight . . . add payload capacity, chances are you'll find just the combination of properties you want in high strength low alloy nickel-copper steels. They're stronger and tougher than plain carbon steels. And they're readily formed and welded.

Complete information available

New manual, "Nickel-Copper High Strength Low Alloy Steels", tells all you need to know about these nickel steels . . . their properties, how they cut weight, and much, much more. Just write.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N.Y.

**Cuts down "DRAG"...
cuts operator fatigue**



**HIGH
VISIBILITY!**



No more energy wasted on handling heavier, less flexible welding cables. U. S. Royal Gold *Fluted* Welding Cable not only cuts down "drag" and operator fatigue, but also facilitates welding in cramped quarters.

EXCLUSIVE! U. S. Royal Gold's unique yellow jacket of 60% natural rubber provides unbeatable visibility, reduces the hazard of accident which is present with *black* cable. Also, the yellow provides contrasting color to black for conductor identification when two cables are used on welding machines.

LONGER LIFE! The greater flexibility of U. S. Royal Gold means greater dependability at terminal connections, minimum maintenance. Higher visibility reduces danger of accidental damage, adds more life to cable.

COOLER TO HANDLE! The unusual *fluted* jacket provides greater surface area and thereby dissipates heat faster.

SUPERIOR IMPACT RESISTANCE! Proved by tests to be greater than that of conventional constructions.

GREATER MOISTURE RESISTANCE! That's because of the special 60% natural rubber insulation. Added protection is provided by the jacket, also of 60% natural rubber. Get U. S. Royal Gold at electrical supply houses.

Free Folder Gives Facts demonstrating the superiority of U. S. Royal Gold *Fluted* Welding Cable. Write to us for your copy at Rockefeller Center, New York 20, N. Y.

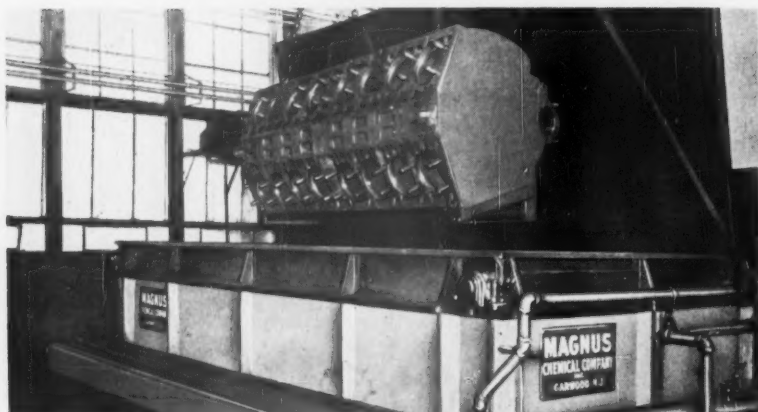


Electrical Wire & Cable Department

United States Rubber



From the smallest...



to the LARGEST diesel engine part...

ONE METHOD CLEANS ALL— FASTER, MORE ECONOMICALLY

Everything, from the smallest injector part to the block of a 16-cylinder engine, can be cleaned faster and at lower cost when the Magnus Method of mechanical agitation is used. It's the modern, labor-saving cleaning method now in use by operators of 76% of the diesel horsepower on class 1 roads.

There's a wide range of Magnus agitating cleaning equipment available—from small bench units for cleaning small, delicate parts to a 6½ ton capacity machine for cleaning diesel blocks. These, together with the recommended Magnus cleaner are guaranteed to substantially lower your cleaning costs with greatly improved cleaning results.

If you are not already using the Magnus method in your shops and are interested in the savings it can make for your road, a Magnus railroad specialist will gladly give you full information.

Or, write for the Magnus Railroad Cleaning Handbook. Magnus Chemical Co., Inc., 77 South Ave., Garwood, N. J.



RAILROAD DIVISION
MAGNUS CHEMICAL CO., INC.

a world-wide organization specializing in cleaning and protection of all surfaces.

SUPPLY TRADE NOTES

(Continued from page 78)

Inc., of Detroit, manufacturer of welding electrode holders, welding helmets, safety goggles, and other welding supplies for the electric arcwelding field. Present distribution channels will be maintained. A. C. Gilbert is general manager.

JOSEPH T. RYERSON & SON, INC.—Alfred J. Olson, sales manager, has been appointed general sales manager at Chicago.

THOR POWER TOOL COMPANY.—Kenneth V. Bennett has been appointed manager of the new branch office at 2024 Chamberlayne avenue, Richmond, Va.

CHICAGO RAILWAY EQUIPMENT COMPANY AND SUPERIOR CAR DOOR COMPANY.—Philip A. Laret has been appointed southwest representative at St. Louis.

CRANE COMPANY.—Neele E. Stearns, vice-president for planning and development of Inland Steel Company, has become president of the Crane Company.



MAGNAFLUX CORPORATION.—Roy O. Schiebel, sales manager, has been appointed to the newly created position of second vice-president, sales and marketing, with headquarters in Chicago.

EVANS PRODUCTS COMPANY.—Evans has entered into an agreement for the acquisition of substantially all of the assets of the Haskelite Manufacturing Corporation, Grand Rapids, Mich. Haskelite manufactures doors, door units and laminated wood products.

WAUGH EQUIPMENT COMPANY.—Stanley H. Fillion, research engineer, has been appointed chief engineer. Walter C. Dilg has been appointed assistant chief engineer.

DIESEL RECLAMATION SERVICE COMPANY.—J. E. Hammett, formerly assistant to general master mechanic, Louisville & Nashville, has been appointed sales representative of Diesel Reclamation in the southern states.



This is the fourteenth in a series of advertisements about the people of Standard.

Occupation: Railroading Hobby: Railroading

Meet Ralph M. McLean, Jr.

All his life he's been a railroad man, carrying along an old family tradition established by his grandfather and father.

When he's not on the road for Standard, Ralph makes Chicago his home—a home brightened by his charming wife, an active son and a lovely daughter.

On the job, Ralph sells Standard products to

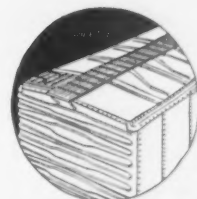
the railroads of the Southwest, providing the service and assistance that are the mark of a Standard salesman.

All of the Standard team is instantly ready to provide the finest service there is—whether your order is for one car or hundreds—for new car parts or replacements.

You can depend on Standard to get cars on the road, paying their way.



Improved Dreadnaught Ends



Diagonal Panel Roofs

9 out of 10 house cars now in operation on America's railroads are equipped with Standard Ends and Roofs.



Standard RAILWAY EQUIPMENT MANUFACTURING COMPANY

General Office: 4527 Columbia Ave., Hammond, Ind. • New York • Chicago • St. Paul • San Francisco
Standard Railway Equipment Manufacturing Company, (Canada) Ltd. Sun Life Building, Montreal

EQUIPMENT

(Continued from page 10)

light weight. Its orbital type action is powered by a universal series wound motor for a-c or d-c operation, delivering a 6,200 rpm. It weighs 5 lb.

The sander is 8-in. long (9½ with knob) and has a 10-ft lead cord. The sanding area is 4½ by 5½ in. The orbit is ¾ in.

The sander can also be had in kit form (No. 16K). The kit includes 18 abrasive sheets, permanent-type template, two felt pads, Neoprene contour pad, lambs' wool cover and a fitted steel case. *Thor Power Tool Co., Speedway Mfg. Div., Dept. RLC, Cicero, Ill.*

Lining Material

Conoglas, a lining laminate, has been developed to line bins, tanks, freezers, freight cars, and similar food storage or shipping containers. This glass fabric reinforced polyester laminate is produced by a continuous process. It is available in 150-ft rolls or cut sheets, 36 in. wide.

The material is said to provide a durable, stain-resistant and waterproof surface. It is white and flexible and will not support the growth of either mold or fungus. It is non-toxic and cannot stain or corrode when washed with disinfecting chemicals, including household bleach.

The laminate is .018-in. thick and

weighs .150 lb per sq ft. It is reported to be unaffected by alcohol, mineral acids, vegetable oils, salt water, weak alkalis or common solvents such as toluol, heptane and carbon tetrachloride.

Installation methods vary slightly with each use. Generally, the material adheres with contact adhesives, epoxy adhesives or mastics. *Continental Can Co., Conolite Div., Dept. RLC, 205 West 14th st., Wilmington 99, Del.*

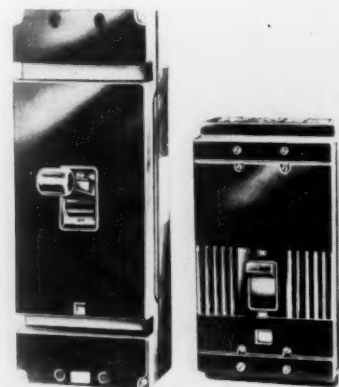
"...If it's Miller you know it's the finest..."



Wherever industry exploits the greater profit possibilities of arc welding processes, Miller selenium rectifier type dc welders have earned re-order respect.

Adapted by design to widest range of specialized and automatic applications, the Miller SR series is offered in single or duplex models of from 200 to 1200 amperes with 60% duty cycle ratings. Lowboy units (27½" high) for stacking.

Miller ELECTRIC MANUFACTURING CO., INC.
APPLETON, WISCONSIN
distributed in Canada by CANADIAN LIQUID AIR CO., LTD. Montreal



Circuit Breakers of Reduced Size

A compact 800-amp molded case circuit breaker which is 6½ in. shorter than conventional breakers of the same rating has been announced by GE.

Designated as the KM-frame breaker, this design covers applications now using M-, L-, and KL-frame sizes. It permits space savings in the ultimate size of the equipment in which it is incorporated, and at the same time simplifies stocking by making possible standardization on a single equipment design.

One frame size can now be used for all ratings from 125 through 800 amp. Savings in space up to 30 per cent for each breaker are possible in ratings above 400 amp.


The breakers are available in 2- and 3-pole designs. The 2-pole units are rated 125 to 800 amp, 600-volts a-c; and 125 to 600 amp, 250 volts d-c. The 3-pole units are available in ratings of 125 to 800 amp, 600-volts a-c.

Interrupting ratings of the new breaker are 50,000 amp rms asymmetrical at 240 volts a-c; 35,000 amp at 480 volts a-c; 25,000 amp at 600-volts a-c; and 20,000 amp at 250 volts d-c.

The breaker is Underwriters' Laboratory listed through 600 amp. *General Electric Company Circuit Protective Devices Department, Plainville, Conn.*

Molded Car Seats

These foamed vinyl seats have less than a dozen components. The integral



YES! Effective March 1, 1957, the Southern® cast steel wheel is A.A.R. approved for full interchange service! The 1957 rules of interchange, issued January 1, are modified to cover this A.A.R. acceptance. A new A.A.R. specification, M-208-56, covers purchasing and inspection procedures.

In granting this formal approval, the A.A.R. recognizes the many years of research, the long experience in actual road service, and the hundreds of thousands of miles rolled up by these wheels as produced in our modern, new foundry at Calera, Alabama. Here, today, is truly *the* freight car wheel of tomorrow!



RAILROAD PRODUCTS DIVISION
230 PARK AVENUE, NEW YORK 17, NEW YORK

NEW A. A. R. STANDARD FOR INTERCHANGE SERVICE!

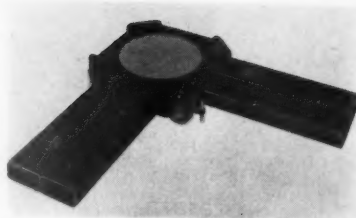


To improve your product

glass-reinforced polyester material molded on the steel frame forms a one-piece unit. This serves as a support for the molded Vinylfoam cushioning, with its contoured surfaces and pin mold cores. It is said to have a favorable compression quality for vehicle seating.

The cushioning portion is heat-sealed to an encasing vinyl skin. These can be snapped on or off as a unit for cleaning or eventual replacement.

These seats are available in any color, including white and in numerous embossed patterns. *Elastomer Chemical Corp., Dept. RLC, 212 Wright Street, Newark 5, N. J.*



Underfloor Wiring

A flush raceway for an underfloor wiring system has been made available. Known as Flushduct, it is used primarily

for modernizing existing buildings. It is installed by trenching the existing floor so the ducts can be installed flush with the surface of the floor. Linoleum or other top surface materials are then laid directly over the duct system.

The ducts are furnished in 10 ft lengths, with outlets spaced every 24 in. along the duct and each outlet closed with a brass cover plate. They are available in single duct, two duct and three duct systems. The two and three duct systems are welded together.

Generally, standard elbows and fittings comprise the system components. Specially designed set screws hold the duct firmly in place and maintain positive electrical grounding continuity. *National Electric Products Corporation, Gateway Center, Pittsburgh, Pa.*

Improved FLEETWELD 47 by LINCOLN

**Iron powder electrode for
mild steel with AC or DC**

Up to 30% more weld per rod!

cuts welding costs by:

- having one electrode for down-hand and out-of-position work
 - easier welding with no tendency to sticking
 - higher deposition rate...10% to 30% faster arc speed
 - less spatter
 - easier slag removal
- than conventional E-6013 electrodes.

Send for Specifications and Procedures in Weldirectory SB-1351. Write Lincoln Electric Railway Sales Company, 11 Public Square, Cleveland 13, O. Railroad Representatives of



Upper weld made with one 14" conventional E-6013 electrode in one minute. Bottom weld made with one Improved Fleetweld 47 electrode in 1.13 minutes.

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

Lincoln... one dependable source for all your arc welding needs



Heavy Duty Truck

This model 7260-D truck, designed to handle extra heavy loads such as tools, transformers and batteries, is of all-steel construction. Two or three shelf models are offered with an optional drawer. The 20 x 28 in., 14-gage shelves are adjustable and reversible with folded edges for strength and safety. Overall standard height is 32-in.

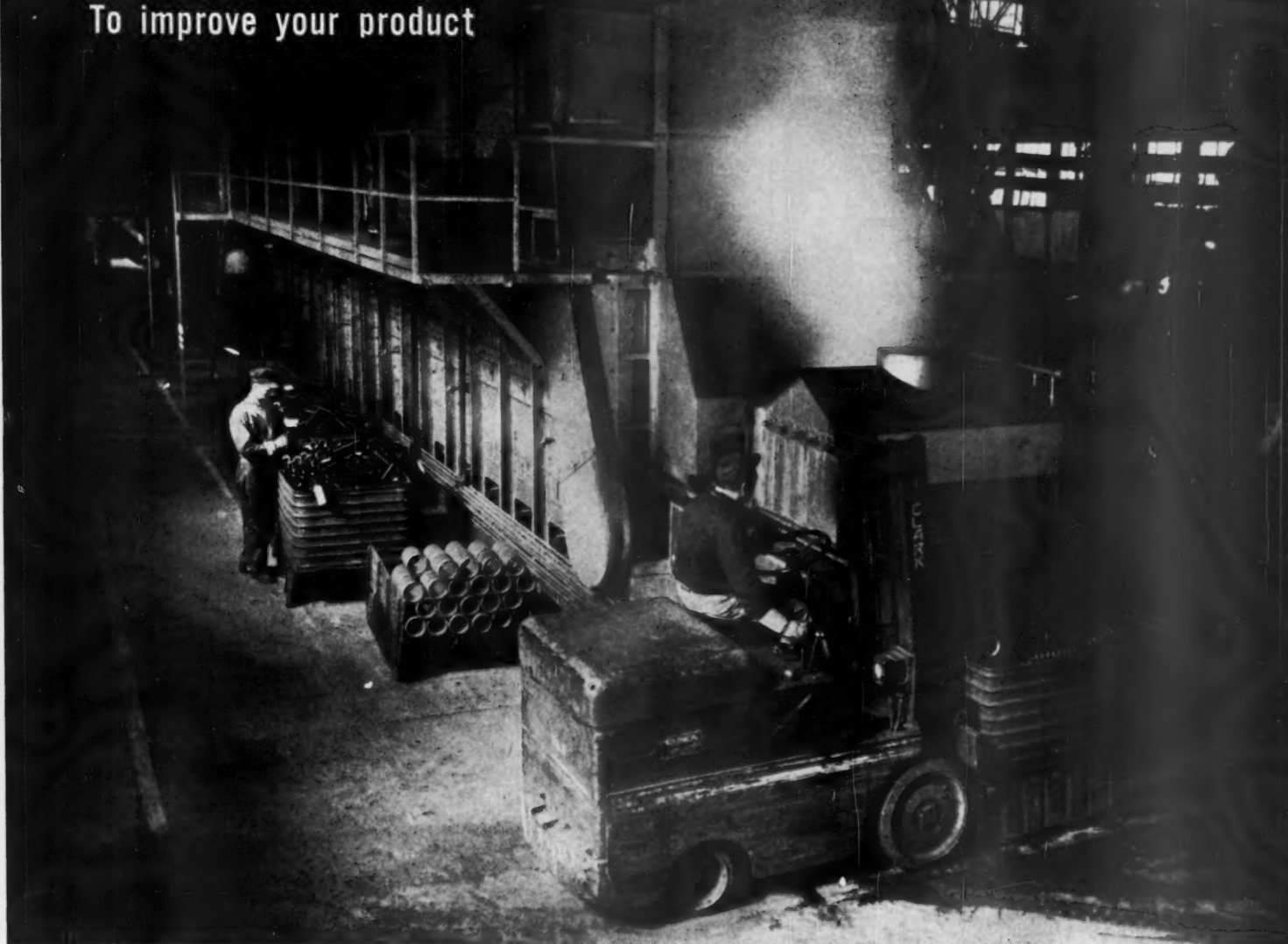
The truck is available with stationary feet, as well as with hard rubber casters. Baked enamel standard finishes are gray, green, beige or brown. *Toledo Metal Furniture Co., Dept. RLC, Toledo, Ohio.*

Internal Periscope

An instrument called a borescope, similar to the cystoscope used in the medical profession, is now available for examining interior surfaces of cylinders, tanks and also the inside of small bores or holes. It is a long tube with a tiny incandescent lamp and an objective lens in one end, and an eyepiece with ocular lens and erecting prism in the other. Through the length of the tube, which may be only $\frac{3}{100}$ of an inch in diameter, are achromatic intermediate lenses, plus wiring for the lamp.

It can be inserted through openings as

To improve your product



Over 12 process steps are integrated into a single operation at ALCO spring manufacturing facilities. Here hot-wound railroad springs are automatically ejected from furnace after completing heat-treatment process.

ALCO "PERFORMANCE RATED" SPRINGS MEET MAXIMUM RAILROAD REQUIREMENTS

Automation Methods Assure Uniform Spring Quality, Precisely Meet AAR Specifications; ALCO Railroad Spring Production Experience Spans 80 Years

Millions of "Performance Rated" Springs from the nation's leading producer — ALCO — are in constant use on railroads around the world. ALCO's pioneering leadership assures reliable, high-quality railroad springs from people who know *more* about spring making.

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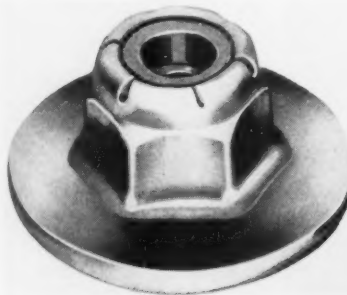
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small as $\frac{1}{10}$ of an inch in diameter to view surfaces up to 20 ft away. Detecting cracks and faults in the inner walls of engine cylinders and valve seats which might cause trouble is a typical example of the use of borescopes. Time-consuming dis-assembly of engines may, in some cases, be eliminated. *National Electric Equipment Company, Dept. RLC, Elmhurst, N. Y.*



Flanged-Base Self-Locking Nut

This flanged hexagon self-locking nut, with a large washer-type seat, can be used for fastening applications involving spring tension. The bearing area of the Type 1994 nut is said to eliminate the need of individual nuts and special washers.

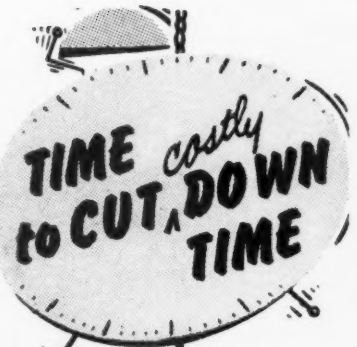
During shipment of a spring-mounted unit, the nut can be turned down to make a solid mounting which cannot shift. Upon delivery, the nut is backed off to the proper spring tension. Its base flange, against which the spring seats, is 1 in. in diameter. The nut is steel and is furnished with a plain or plated finish. *Elastic Stop Nut Corporation of America, Dept. RLC, Union, N. J.*

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The Aircomatic inert gas welding process can now be used for cutting non-ferrous metals in addition to welding ferrous and non-ferrous metals. This new process requires no special techniques; only adjustments in gas flow and steel wire speed are needed. Both production machine equipment and manual equipment can be adjusted for cutting with equal facility.

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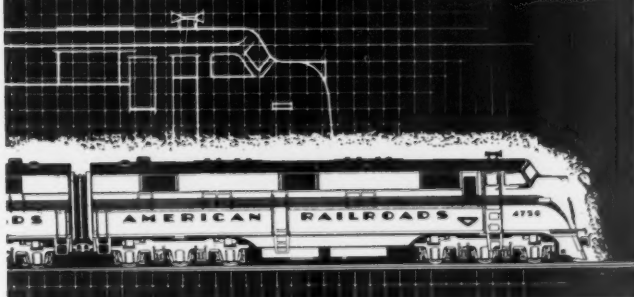


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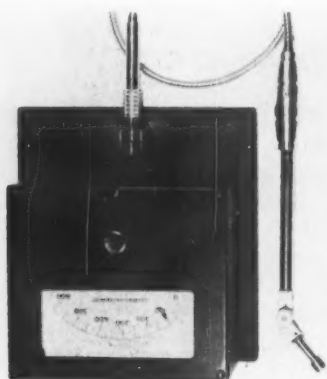
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The heavy-duty welded steel case is magnetically shielded. Gaskets make it dustproof, fumeproof and splashproof. *Illinois Testing Laboratories, Inc., Dept. RLC, 420 N. LaSalle st., Chicago 10.*

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

STOP RUST. 32-page 1957 coatings manual, Form No. 256, contains information and recommendations for determining specific coatings needed to protect practically any rustable metal surface. Basic principle of Rust-Oleum's fish-oil penetration through rust and into the pores of the metal vividly illustrated. Applications on girders; tanks; water, steam and brine piping, equipment, etc., shown in full color. Chips show range of colors available in primers; fast-drying indoor and outdoor short oil coatings for use where dampness, salt air and spray, fumes, and abrasion are present, and long oil type coatings where normal fumes, smoke, gas, and weather conditions exist. Galvinox, heat resistant, chemical resistant, and floor coatings covered separately. (Write: *Rust-Oleum Corp., Dept. RLC, 2799 Oakton st., Evanston, Ill.*)

WIRE ROPE SLINGS. Catalog A-931 includes information on all purpose slings with tapered sleeve attachments, Roegal cable-laid slings, flatweave slings, railroad slings and special assemblies, fittings, and general information. (Write: *John A. Roebling's Sons Corp., Dept. RLC, Trenton 2, N. J.*)

SPRINGS FOR INDUSTRY. 16-page bulletin on production of hot- and cold-wound steel springs. Describes Alco's adaption of automation techniques in producing springs. Contains formulas and specifications for helical extension springs and volute and Belleville disc springs, design recommendations and a chart listing physical properties for calculating springs in 22 materials. (Write: *Alco Products, Inc., Dept. RLC, P. O. Box 1065, Schenectady, N. Y.*)

FLAW LOCATION. 4-page folder, "Flaw Location with Turco Dy-Chek," intended

to acquaint new personnel with most efficient procedures for performing penetrant inspections and to reacquaint qualified personnel with necessary precautions that must be observed during inspections. (Write: *Turco Products, Inc., Dept. RLC, 6135 S. Central ave., Los Angeles 1.*)

NUCLEAR SYSTEMS. 8-page booklet briefly describes the radiation facility of the Budd Company's Nuclear Systems Division, its products and services. (Write: *Nuclear Systems, a Division of the Budd Co., Dept. RLC, Philadelphia 32.*)

CUTTING MACHINES. 4-page Bulletin DH-460-B describes complete line of Campbell abrasive machines both for dry and wet cutting. Contains also specification table and data on Allison abrasive cutting wheels. (Write: *American Chain & Cable Co., Dept. RLC, 929 Connecticut ave., Bridgeport 2, Conn.*)

STUD WELDING. 36-page booklet on industry standards in arc-welding studs, pins and tapped pads for stud welding contains a complete index and reference to equipment and accessories. Lists size minimums and maximums and details mechanical properties, chemistry, thread sizes, plating and annealing information and other data for engineers, production and purchasing men. (Write: *K S M Products, Inc., Dept. RLC, Merchantville 8, N. J.*)

BATTERIES. Bulletin DL-577/54 covers complete line of Slyver-Clad lead-calcium and lead-antimony batteries for railroad diesel starting applications. Specifications include data on battery ratings and capacities, details of design and construction, dimensions and weights, also comparison data. (Write: *C & D Batteries, Inc., Dept. RLC, Conshohocken, Pa.*)



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
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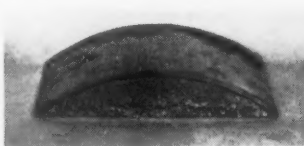
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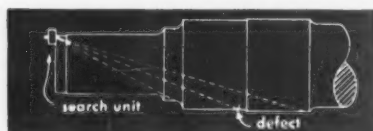
HOW REFLECTOSCOPE "FINDS THE TRUTH"



Sawed axle showing crack in dust guard fillet area found with Reflectoscope.

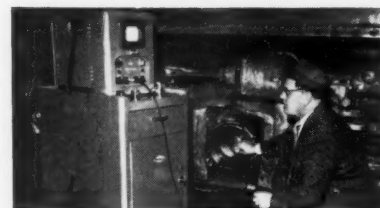


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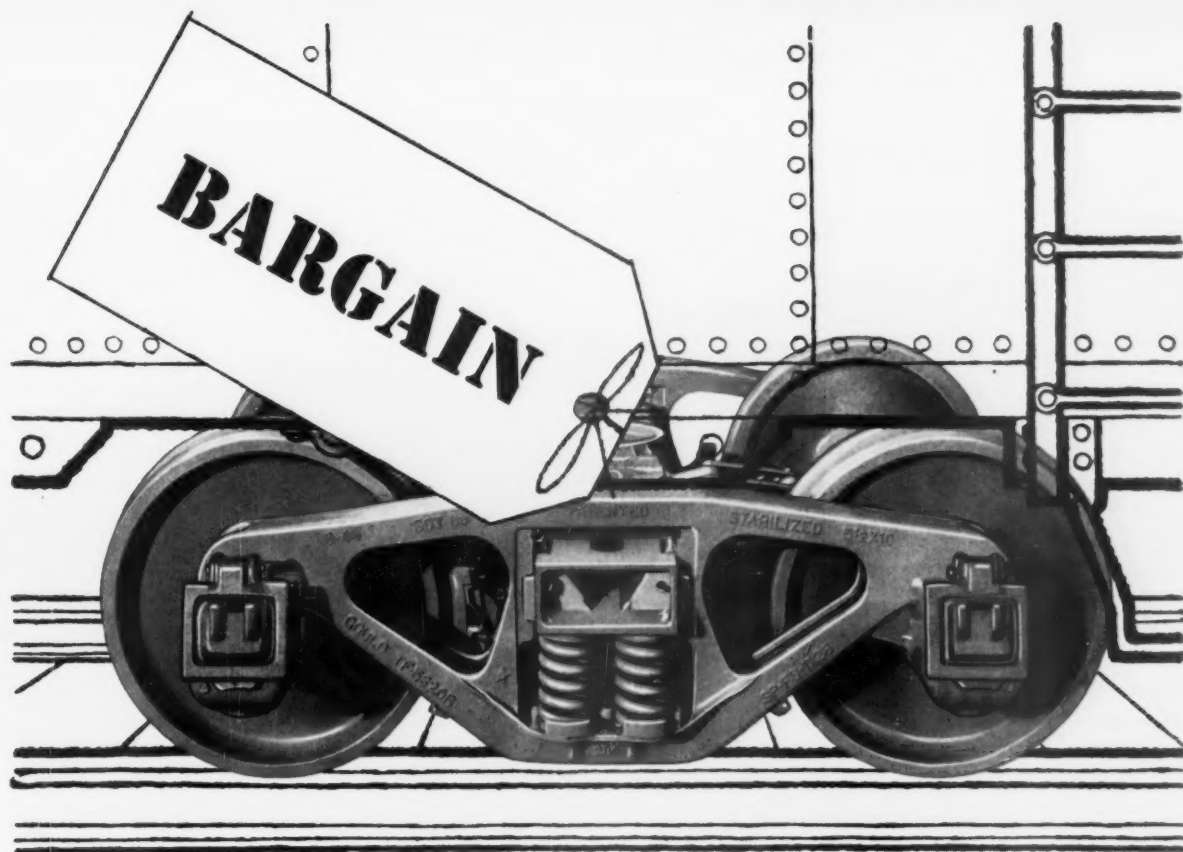
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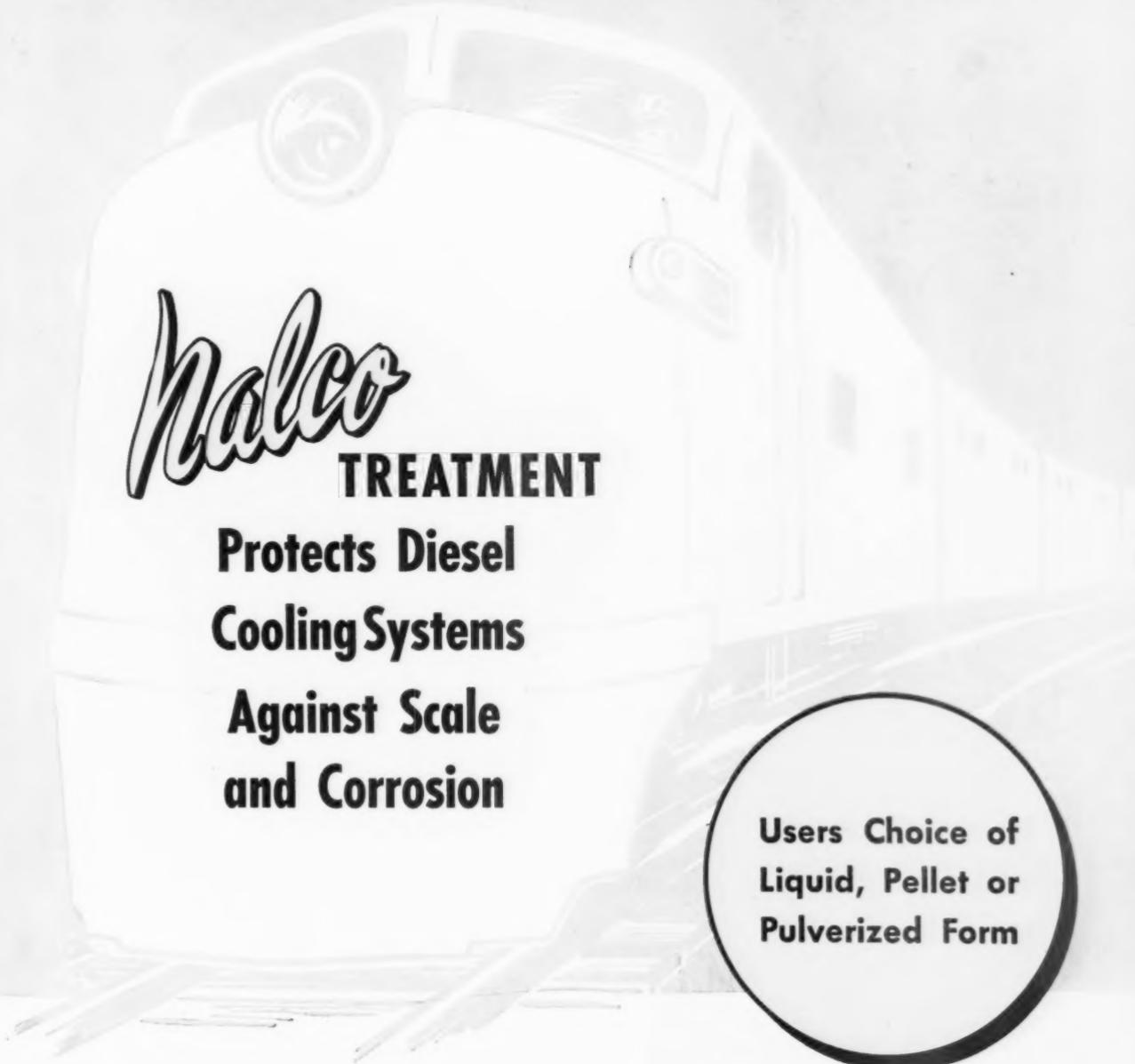
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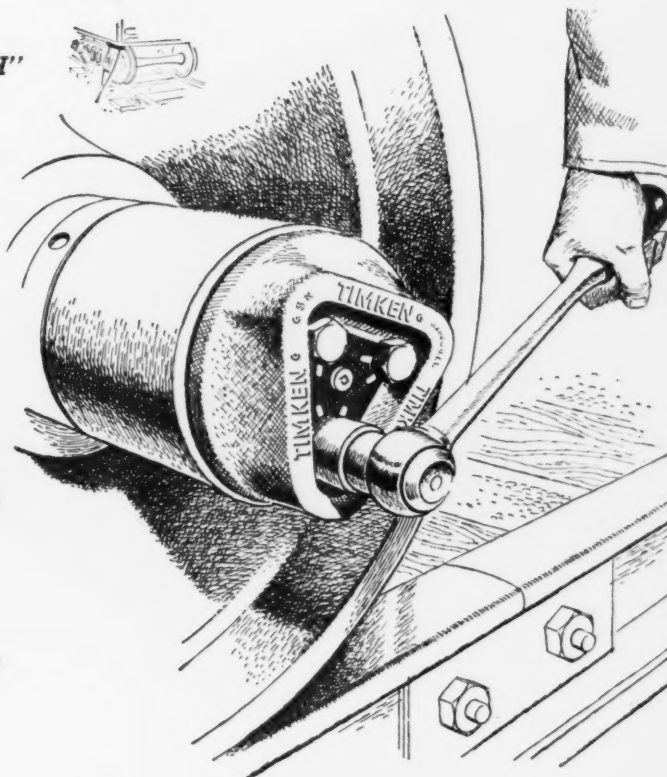
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over and over and over in operating
and maintenance savings*



USE of "crutches"—devices attempting to improve friction bearing performance—will never answer the hot box problem. The one sure cure is Timken® tapered roller bearings, because they eliminate the cause of hot boxes—the friction bearing itself.

With Timken bearings, you also slash the cost of bearing inspection and lubrication. Costs that hang on even with crutch devices. Timken bearings cut terminal bearing inspection time by 90%, reduce lubricant costs as much as 95%. The fact is, the new Timken heavy-duty type AP (All-Purpose) bearing assembly can go three years without the addition of lubricant. When all railroads go "Roller Freight", they'll save an estimated \$224 million a year, earn about a 22% net annual return on the investment.

EXTRA SAVINGS, TOO

THE TAPER DOES IT

Doing away with the hot box problem is a simple job for Timken bearings. They roll the load instead of sliding it. There's no metal-to-metal sliding friction as with friction bearings. And the tapered design makes Timken the only roller bearing you can be sure will cure the hot box problem and reduce operating and maintenance costs to the lowest possible point. The taper in Timken bearings prevents lateral movement. There's no pumping action—less lubricant is required. There's no scuffing or skewing—bearings last longer.

And to be sure of the quality of Timken bearings from melt shop to final bearing inspection, we make our own steel. We're America's only bearing manufacturer that does.

PRACTICAL CONVERSION PLAN USED

Figuring in the extra cost of buying and maintaining "crutch" de-

vices that don't cure, it's easily seen that the difference in price between friction and roller bearings is smaller today than ever. And now a program adopted by one major American railroad promises an even greater reduction. This railroad has put into effect a practical program for converting to "Roller Freight". It works like this. Every freight car coming into the shops for major repairs is converted to roller bearings. This simple, workable plan 1) facilitates a steady shop and labor schedule, keeping installation costs to a minimum, 2) allows the railroad to absorb the cost for its conversion to roller bearings over a period of years.

Instead of trying to shore up friction bearings with costly "crutches", cure the hot box problem and gain maximum savings in operating and maintenance costs with Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable: "TIMROSCO".

Only **TIMKEN®** bearings cure the hot box problem and
cut operating and maintenance cost to a minimum

